VOL. XXIII. Nº 5. MAY 1938

MECCANO MAGAZINE

THE FORGING PRESS

6D.

MECCANO

BETTER MODELS
BIGGER OUTFITS



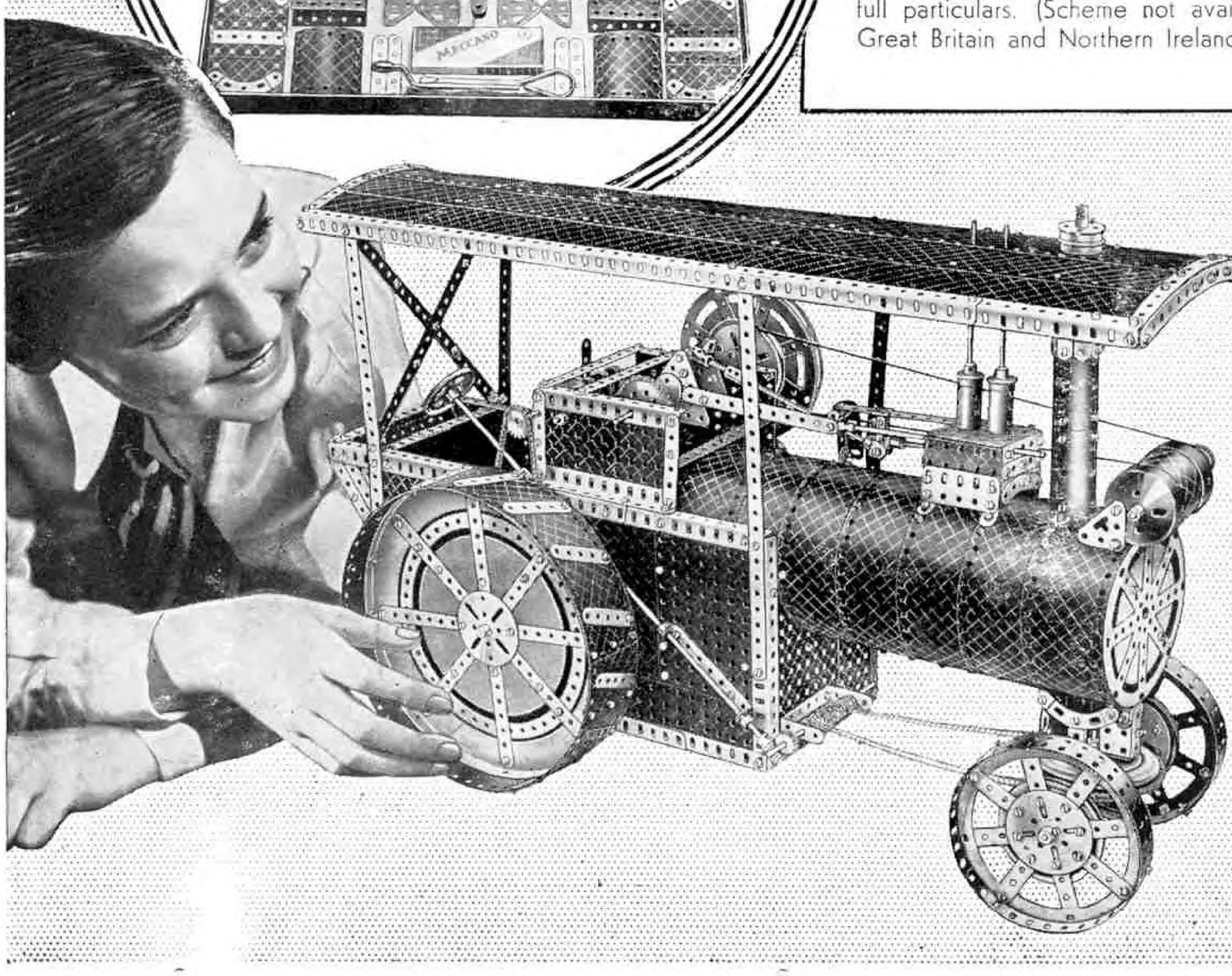
Meccano, the world's greatest toy, is better than ever. It is the most wonderful and fascinating hobby in the world for boys. Ask your dealer to show you the fine new range of Outfits.

With a Meccano Outfit and a Meccano Clockwork or Electric Motor dull evenings are a thing of the past. There is no end to the number of playtime models that can be built.

COMPLETE OUTFITS

	s.	d.
No. 0 Outfit	3	0
No. 1 „	4	6
No. 2 „	6	0
No. 3 „	9	0
No. 4 „	12	6
No. 5 „	18	0
No. 6 „	24	0
No. 7 „	35	0
No. 8 „	66	0
No. 9c „	95	0
No. 9w „	125	0
No. 10 „	255	0

Meccano Outfits from No. 8 upwards can be purchased also through the New Meccano Deferred Payments Scheme. Ask your dealer for full particulars. (Scheme not available outside Great Britain and Northern Ireland.)



MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

EARLY SUMMER

SUPER TRAFFIC HORN CLEARS THE WAY

Hamleys News

· HAMLEY · BROTHERS · LTD · ESTABLISHED 1760 ·

200-202, REGENT ST., LONDON, W.1. **OUR ONLY ADDRESS**

Telephone: REGENT 3161

WONDERFUL CHAIR THAT FITS POCKET

No. 32 *May, 1938*

Why is a Cyclist Like a Snail?

HAMLEYS MAKE HUMAN GRASSHOPPERS



The POGO STICK provides constant amusement for both boy and girl. An attractively coloured stick with sprightly action.

PRICE **10′6**

Carriage 1/-

DON'T BE LATE *for* TEA!



Don't miss strawberries and cream this summer through being out too long on your bicycle. This magnificent watch is shockproof and fits with ease on the handle-bars of any cycle.

PRICE

Postage 4d. **12′6**



Because he carries his house on his back—when he has a BIKE TENT. Specially designed light-weight tent that is ideal for cyclists or hikers. Weight 6 lbs., yet is 6 ft. long, 4 ft. wide and 3 ft. 6 ins. high.

PRICE

Postage 6d. **15′-**

BOY GROWS 2 ft. TALLER



On STILTS—the old traditional trial of skill for boys and girls of all ages has held the place of honour in every generation. Metal with adjustable foot-rests. Rubber pad eliminates slipping.

PRICE **6′11**

Carriage 1/-

WONDERFUL CHAIR THAT FITS POCKET



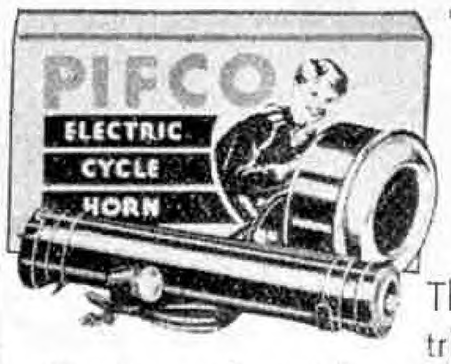
Folding stool. Invaluable for picnics or race meetings. Can be put up in an instant. Will take any weight and can be carried in a pocket.

PRICE

2′-

Postage 4d.

NOT AFTER 11-30



The Pifco electric horn is very effective and provides additional safety on the road. It can be heard with ease above other traffic noises. Complete with Battery.

PRICE

Postage 6d. **7′8**

A LONG WAY AT A HIGH SPEED



This cycle speedometer and cyclometer tells you just how far you've been and gives the speed at which you are travelling. Suitable for all makes of cycles.

PRICE **19′6**

Postage 6d.

HANDY CAMERA Gives Perfect Pictures



Ensign Box Camera complete with two Ensign 6 exposure films. Handy, strong and durable. Pictures 3 in. x 2 in.

PRICE

Postage 6d. **5′6**

PRINT YOUR OWN SNAPS!



Ensign printing outfit—printing frame, measuring jug, fixing bath, two tins hypo fixative, packet of developer. For the Ensign Camera.

PRICE

Postage 6d. **2′6**

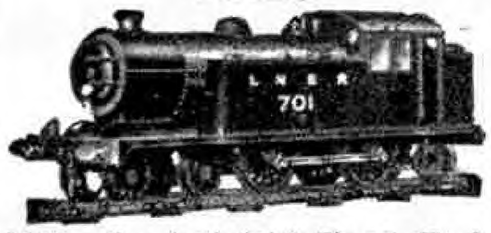
They use spanners at Derby . . . .

YOU'LL GET JUST THE SAME THRILL OUT OF A SCREWDRIVER AND SOME **MILBRO** PARTS!



BUILDING your own trucks, coaches, and permanent way is an absorbing pastime, especially when using the true-to-scale materials that you can get all the thrill of a locomotive assembly shop in your own home! Until you've actually experienced it, you can't imagine the thrill of working a railway that you've built yourself. If you want advice write personally to ★Billie Mills. Get the catalogue, too. It's only 6d. and full of fascinating information.

USE MILBRO TRUE-TO-SCALE MODELS



Milbro Standard 4-4-2 Electric Tank Locomotives, **£2-19-6**

WAYSIDE HALT
S/O, 28 in. long, **3/9** *each*

GOODS DEPOT
S/5, 20 in. long, **10/6** *each*

ENGINE SHED
S/6, 20 in. long, **9/6** *each (single road)*

★*Billie Mills—one of the "Big Three" behind* **Milbro**, *has made a lifelong study of model railway problems.*

MILBRO *TRUE-TO-SCALE models for reliability*

MILLS BROS. (Model Engineers) LTD., Dept. F.S., St. Mary's Rd., SHEFFIELD 2
London Showrooms:
2, Victoria Colonnade, Victoria House, Southampton Row, W.C.1
(Phone: Holborn 9630)

Bluemel's

FAMOUS for QUALITY



Bluemel's Celluloid Mudguards can be fitted to any cycle without interfering with the wheel adjustment. Quickly adjustable and detachable, with built-in mud flap on front guard. **Prices from 4/8 per pair, in Black.** Colours extra.

Write for Pocket Catalogue.

BLUEMEL BROS. LTD., Dept. 27, WOLSTON, Nr. COVENTRY



A genuine Kodak folding camera for 30/-

The SIX-20 FOLDING 'BROWNIE'

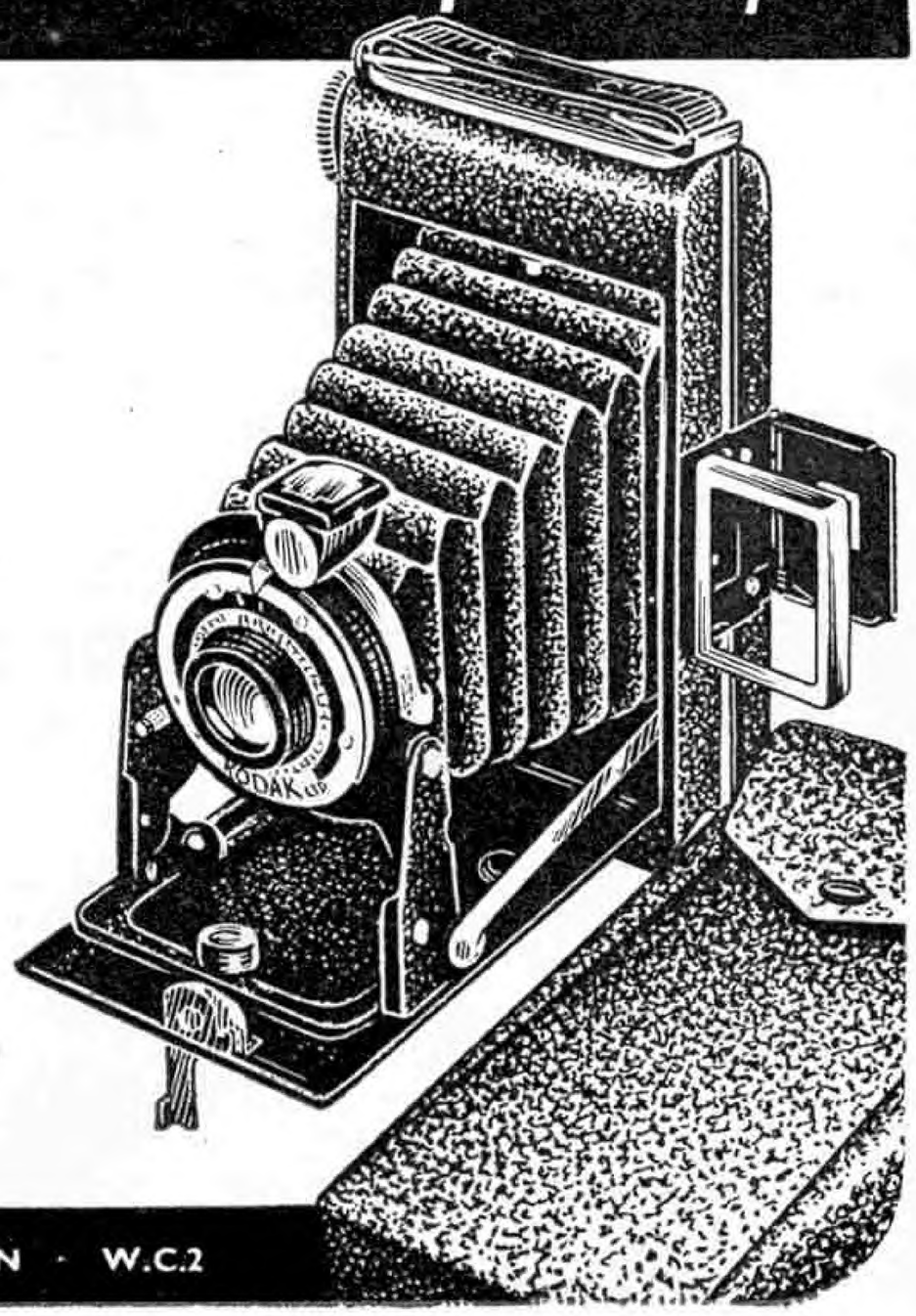
With this camera you get a real Kodak tested lens, a "Time" exposure adjustment, a direct-vision, eye-level finder and a two-way reflecting finder as well.

The camera opens in a flash, all ready for snaps, and closes as quickly, while the back is hinged and the spool holders swing up for easy loading.

It's a smart camera, made even smarter by the shoulder-strap Carrying Case included in the price, and it takes first-class, full-size pictures measuring 3¼ by 2¼ inches.

With two viewfinders - - - - - **30/-**
With eye-level finder only - - - - **27/6**

Ask your Kodak dealer to let you see it!



KODAK LTD. · KODAK HOUSE · KINGSWAY · LONDON · W.C.2

AMAZING NEW TOY!



GYRO CYCLIST SMASHES ALL RECORDS

NEVER SPILLS— NEVER CRASHES

The TRI-ANG GYRO-CYCLE

British Patent 479430. Patents pending in other Countries

Astonishing Robot Pedal Cyclist

This ingenious scientific toy depends for its action on the well-known Gyroscope principle and is set in motion by winding a cord round the projecting hub of the front wheel and pulling smartly away.

The GYRO-CYCLE is an amusingly clever toy. The gay little figure astride the saddle appears to balance himself as he pedals merrily all over the place, and with his flexible arms creates the illusion in the most realistic way that he is steering the Gyro-Cycle by the handle bars.

The Gyro-Cycle will perform the most amazing evolutions for over one minute. Ask your dealer to give you a demonstration.
NO SPRING. NO KEY.

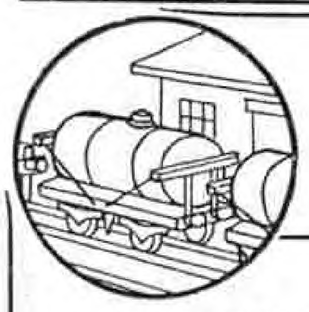
5/-

OBTAINABLE AT ALL GOOD TOYSHOPS AND STORES

TRI-ANG

Made in England by

LINES BROS. LTD., TRI-ANG WORKS
MORDEN ROAD, LONDON, S.W.19



HORNBY ROLLING STOCK

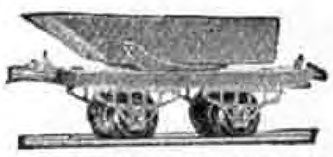




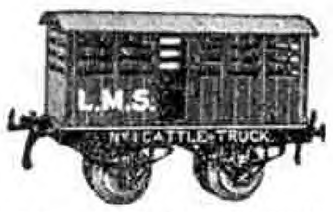
The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many other types, all beautifully finished.
An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list



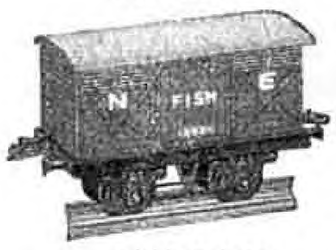
BARREL WAGON
This is an interesting model of a type of wagon used in France and other European countries.
Price **2/6**



No. 0 ROTARY TIPPING WAGON
Price **1/6**



***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Very realistic design.
Price **2/3**



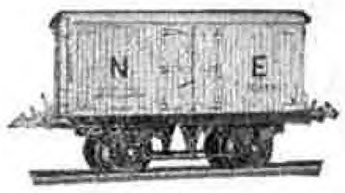
No. 0 FISH VAN
This is a distinctive model. Available lettered N.E., G.W. and L.M.S. Price **1/6**



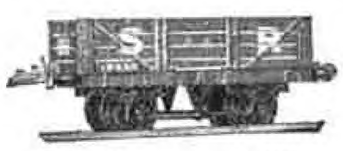
OIL TANK WAGON "ROYAL DAYLIGHT"
Price **1/11**



No. 1 PETROL TANK WAGON "ESSO"
Price **1/11**



No. 0 REFRIGERATOR VAN
Lettered L.M.S., G.W., N.E. and S.R. Finished with the appropriate details. Price **1/6**

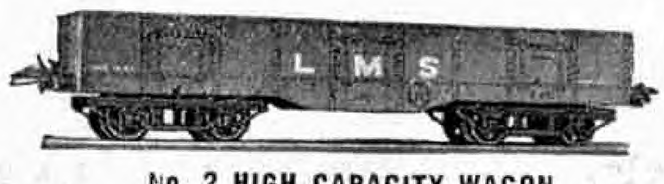


***No. 1 WAGON**
Price **1/6**



***FLAT TRUCK**
Complete with Container.
Price **2/-**

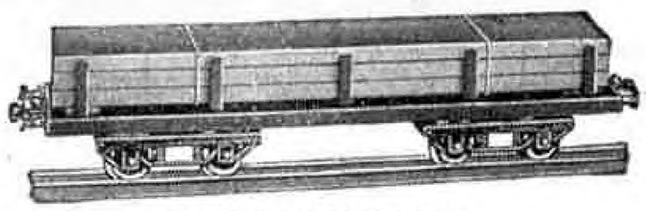
CONTAINERS
L.M.S. (Furniture), L.N.E.R. (Goods), G.W.R. (Insulated), S.R. (Ventilated).
Price **6d.** each.



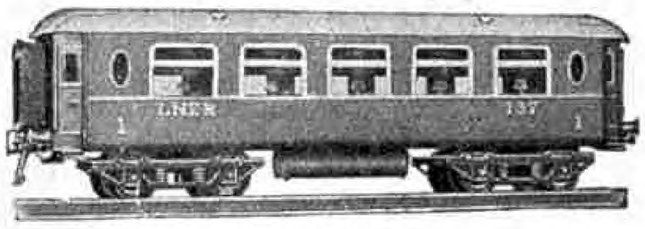
No. 2 HIGH CAPACITY WAGON
Finished in correct colours of G.W.R. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails.
Price **4/-**



***No. 2 CATTLE TRUCK**
Opening doors. (Not suitable for 1 ft. radius rails.)
Price **4/6**



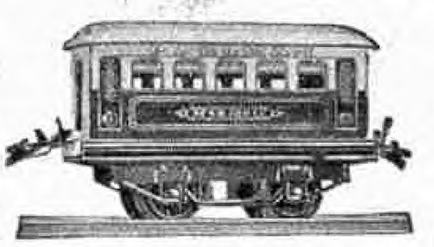
No. 2 TIMBER WAGON
(Not suitable for 1 ft. radius rails.) Price **2/6**



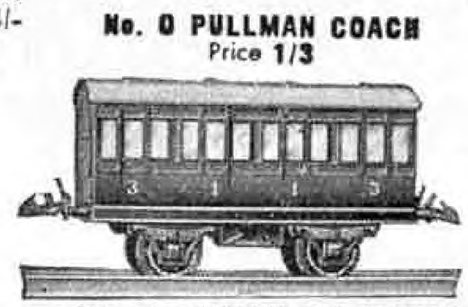
No. 2 SALOON COACH
L.M.S. or L.N.E.R. Not suitable for 1 ft. radius rails
Price **10/6**



No. 2 CORRIDOR COACH
L.M.S. Brake composite. Not suitable for 1 ft. radius rails.
Price **7/6**



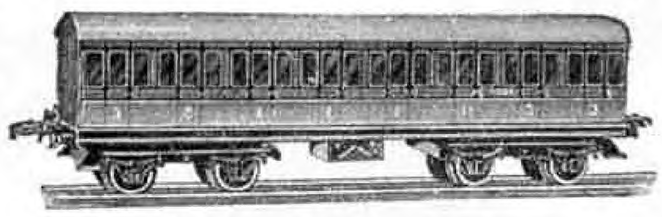
No. 0 PULLMAN COACH
Price **1/3**



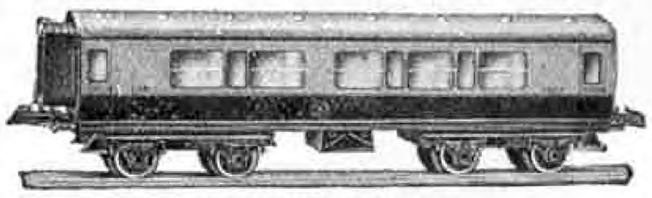
***No. 1 PASSENGER COACH**
Price **2/6**



No. 2 LUMBER WAGON
Fitted with bolsters and stanchions. (Not suitable for 1 ft. radius rails.)
Price **2/11**



***No. 2 PASSENGER COACH**
Not suitable for 1 ft. radius rails. First-third or Brake-third.
Price **7/-**



No. 2 CORRIDOR COACH
G.W. First-third. Not suitable for 1 ft. radius rails
Price **7/6**



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/-**



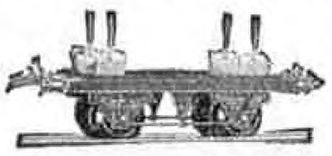
MILK TANK WAGON "NESTLE'S MILK"
Price **4/6**



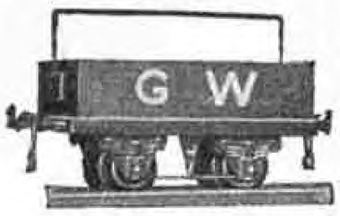
"PORTLAND CEMENT" WAGON
The door at the top opens. Finished in bright yellow.
Price **1/11**



COAL WAGON
Fitted with embossed representation of coal. Price **2/3**



No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport.
Price **1/3**



***OPEN WAGON "B"**
Fitted with centre tarpaulin supporting rail.
Price **2/-**

Lettered L.M.S., N.E., G.W. or S.R.

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

PHENOMENAL PERFORMANCE



★ LOOK OUT FOR THIS NEW MODEL—THE "P.V.6" DIVE BOMBER

WING SPAN 20 INCHES · FLIES 500 FEET · PRICE ONLY 5/-

FROG

MODEL AIRCRAFT

Covered by World Patents granted and pending.

Made in England by International Model Aircraft Ltd.

Sole Concessionaires :

LINES BROS. LTD., TRIANG WORKS MORDEN ROAD, MERTON, S.W.19

OBTAINABLE AT ALL GOOD TOYSHOPS AND STORES

COUPON To Lines Bros. Ltd. (Dept. 5), Morden Rd., London, S.W.19

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and how to obtain handsome enamelled "Frog" Pilot badges.

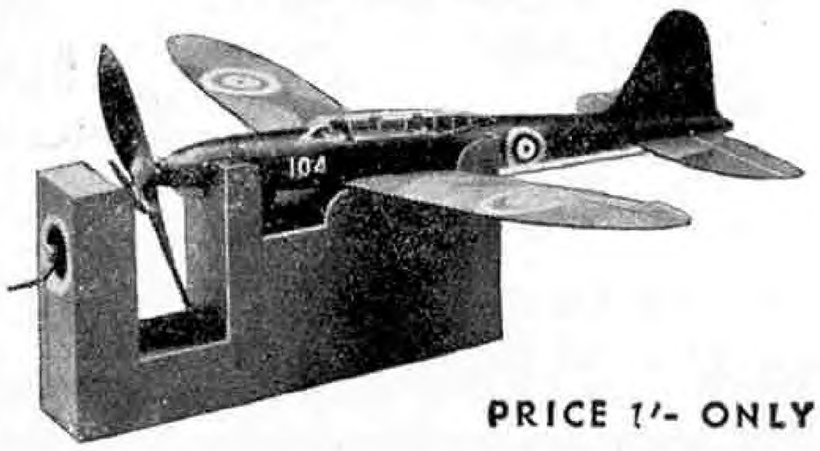
NAME.....

ADDRESS.....

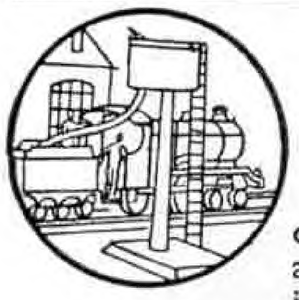
PLEASE WRITE IN BLOCK LETTERS 5.38

Trade Mark Regd.

HIGH SPEED WINDER. This illustration shows how easily these models can be wound for flight with the patent high-speed winder.



PRICE 1/- ONLY



HORNBY ACCESSORIES

There is a splendid range of Railway Accessories in the Hornby Series, each one built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway may be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.



No. 4 STATION

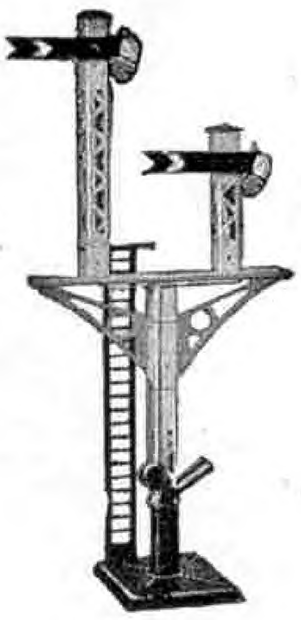
Built up with three detachable sections. Named "Margate," "Wembley," "Ripon" or "Reading." Strikingly coloured, with accessible Booking Hall and Ticket Office Barrier ... ... Price **10/6**

No. 4E STATION

This Station is fitted for electric lighting, otherwise it is the same as No. 4 Station ... ... Price **11/9**



No. 2 SIGNAL, DOUBLE ARM
"Home" and "Distant."
Price **2/3**



No. 2 JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. A very realistic model. Price **5/-**



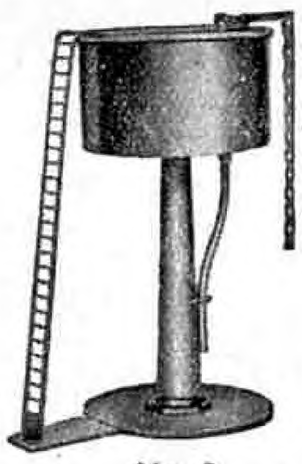
No. 1 SIGNAL GANTRY
"Home" or "Distant."
Price **4/3**



No. 1 WATER TANK
Height 7 in.
Fitted with flexible tube and valve lever
Price **2/6**



TELEGRAPH POLES
Price per pair **3/-**

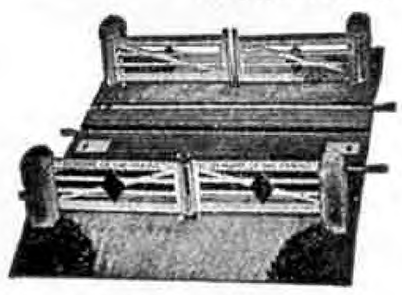


No. 2 WATER TANK
Height 9 in.
Fitted with flexible tube and valve lever.
Price **5/9**

GRAPHITE GREASE
For Springs.
Price per tube **6d.**

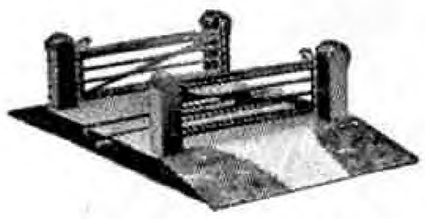


MANSELL WHEELS
These solid die-cast Wheels can be fitted to Hornby Coaches, Vans, etc.
Price per pair **3d.**



No. 2 LEVEL CROSSING
Measures 13½ x 10½ in., with two tracks of gauge O rails in position.
Price **5/3**

No. E2 LEVEL CROSSING (Electrical)
Similar to Level Crossing No. 2 excepting that a third rail is fitted in each of the two tracks.
Price **7/3**

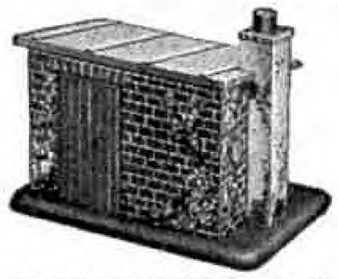


No. 1 LEVEL CROSSING
Suitable for a single track only.
Price **2/11**

No. E1 LEVEL CROSSING (Electrical)
Similar to No. 1 Level Crossing, but fitted with electrical track.
Price **3/9**



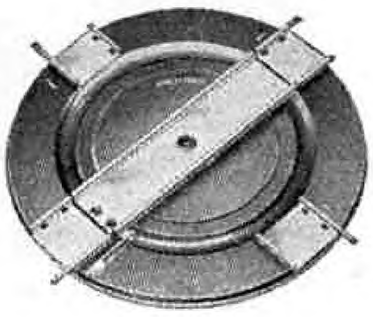
No. 1 SIGNAL CABIN
Finished in colours.
Price **2/6**



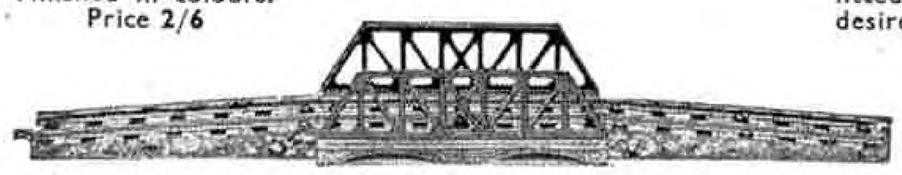
PLATELAYER'S HUT
Price **1/2**



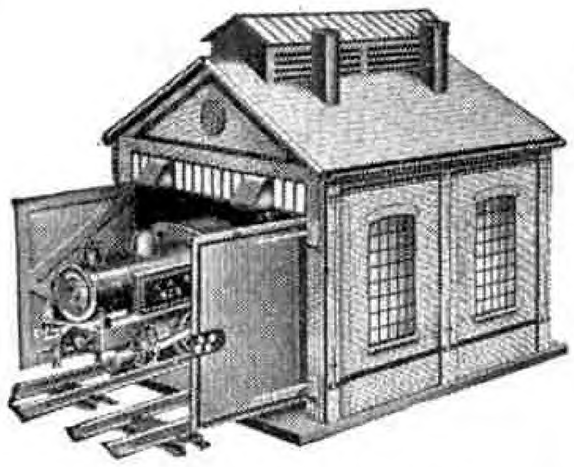
No. 2 SIGNAL CABIN
Dimensions: Height 6½ in., width 3½ in., length 6½ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired. Price **3/6**



No. 1 TURNTABLE
Price **1/11**



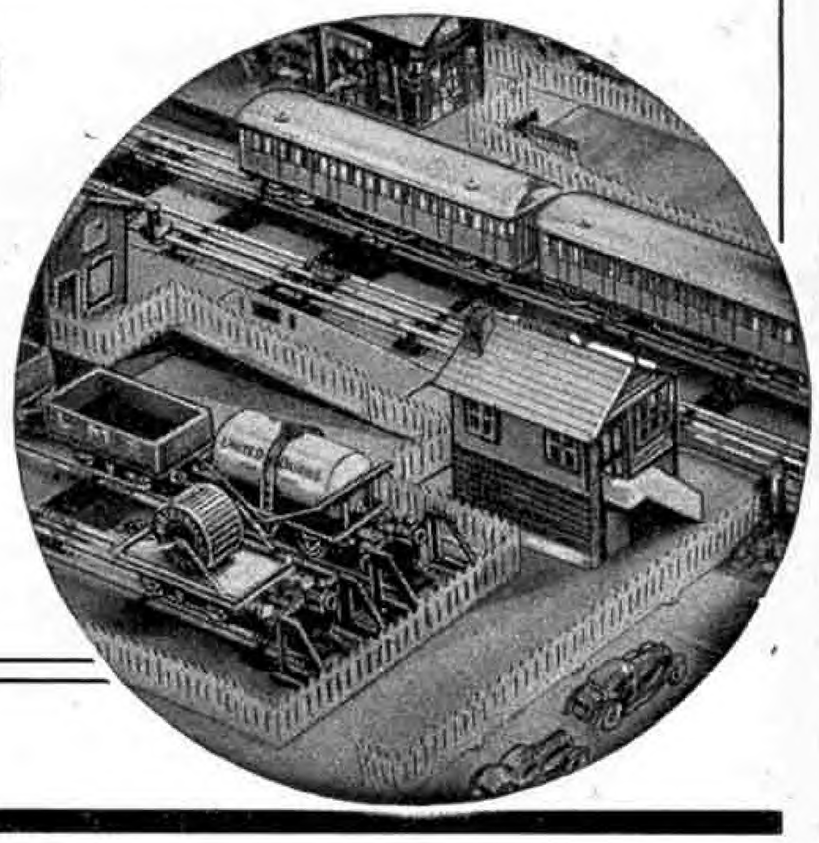
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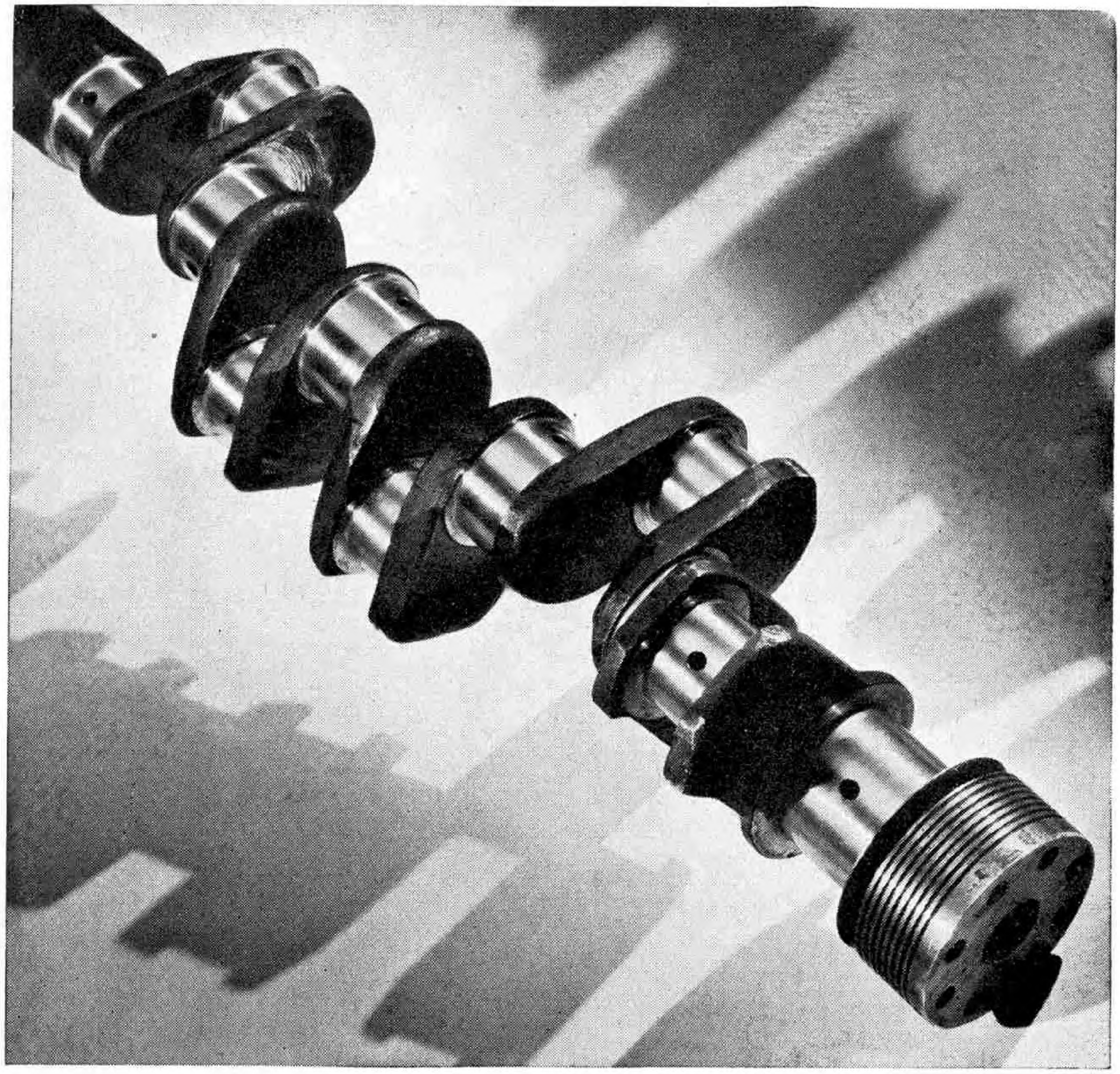
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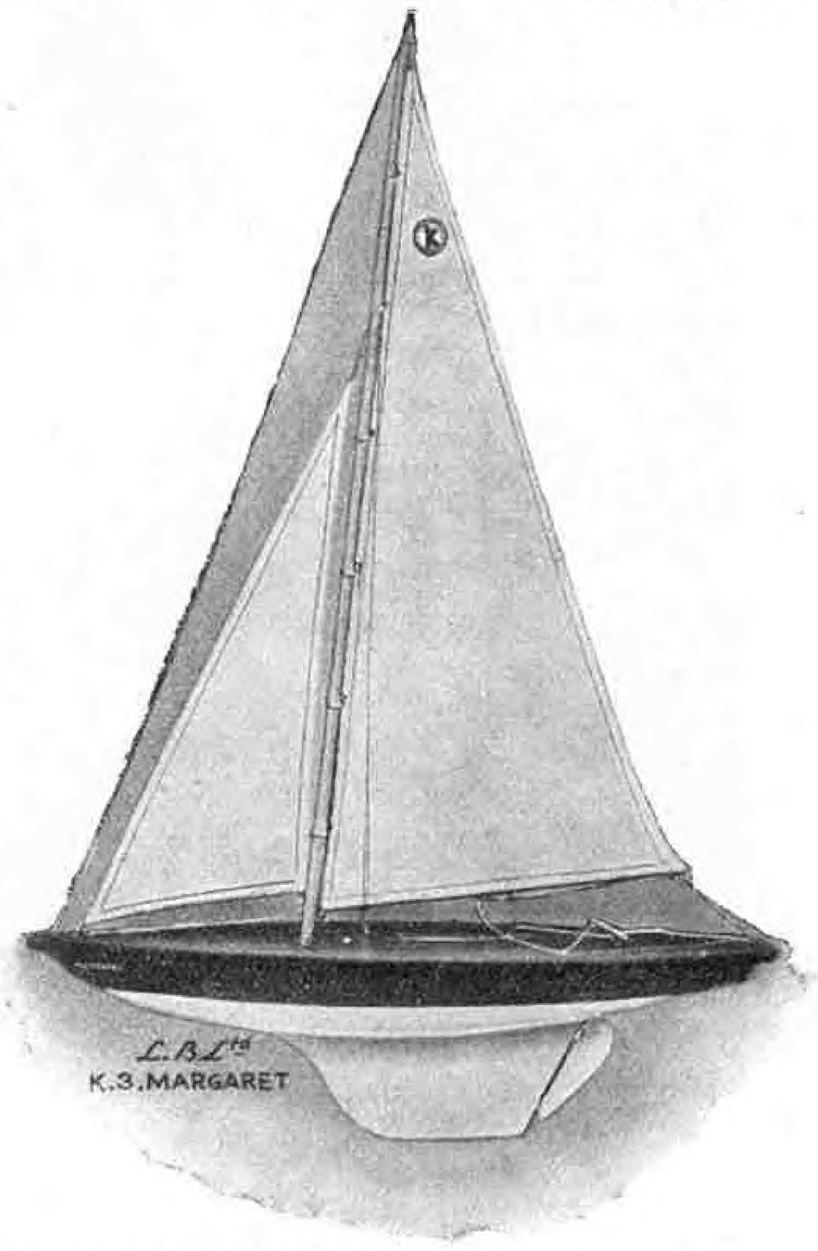
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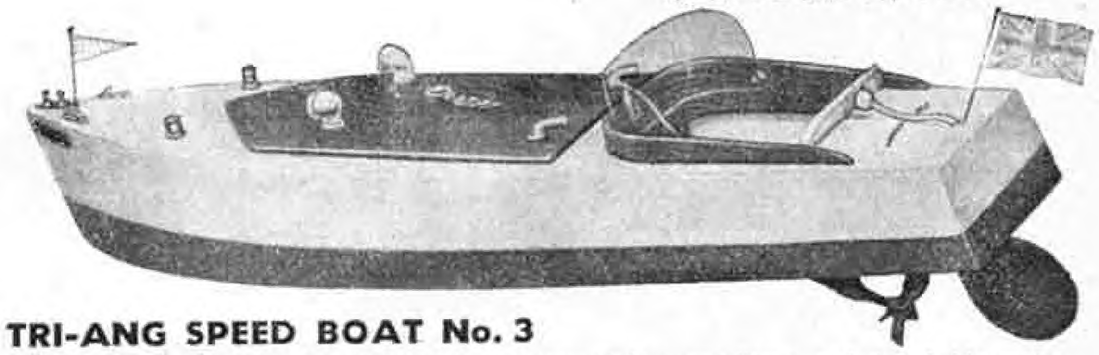


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NEXT MONTH: "BRITAIN'S WATER HIGHWAYS." PUBLISHING DATE: 1st JUNE

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXIII. No. 5
May 1938

With the Editor

The Empire Exhibition at Glasgow

The outstanding event of May will be the opening of the great Empire Exhibition at Glasgow. The ceremony will be performed by His Majesty the King on 3rd May, and from then onward until the end of October visitors will be able to see a wonderful display showing how the people of the Empire work and live.

Many of my readers, particularly those who live in Scotland, will be among these visitors and will be fascinated by the great 300-ft. tower illustrated in the March "*M.M.*," that dominates the scene. Although not quite so prominent as this amazing structure, the various pavilions will be even more attractive, for their contents will form a miniature of the British Empire. There will be machines of all kinds in the Palace of Engineering, and every conceivable industry will be represented in the Palace of Industry. The British railways exhibit will include a miniature railway on which will run scale models of famous trains, one for each of the four companies. There also will be special pavilions for every part of the Empire. The Malayan pavilion will have a scale model of the new Singapore airport and a full size section of a rubber plantation, and that organised by West Africa will be characteristic of the colony, with native craftsmen at work in it.

Will London Disappear?

Attention has been drawn recently to the fact that our country is sinking! This change is taking place so slowly that we have to go back through the centuries to find evidence of it, but this is unmistakable. For instance, the wharf of the palace built at Blackfriars by Cardinal Wolsey 400 years ago is now 7 ft. below the ordinary high tide level of the Thames. Another proof of a different kind is the existence of submerged forests at sea off our coasts. There is a forest of this kind in Liverpool Bay, and tradition tells of the time when a squirrel could cross the site of the present Mersey Estuary by leaping from tree to tree. Other sunken forests seen at low water on the east coast are reminders that a few thousand years ago there was no North Sea, its present bed being then a great plain extending to Holland.

When we go back farther still, we find that England has risen from the sea and sunk under the waves again not once, but several times, and actually has been under water for a much greater period than it has been dry land. These changes take place extremely slowly, however, and the time when London will be submerged is certainly in the far distant future.

A Famous Coach Writes on Cricket

This month I have been able to provide readers with a special attraction in the form of an article on how to become a successful cricketer. This is written by Mr. Harry Makepeace, the former Lancashire County player, and I do not know anyone who is better qualified to help boys who are keen to become good batsmen or bowlers.

Mr. Makepeace enjoyed a long and successful career as a county and Test Match cricketer, and has since coached Lancashire's young amateurs and professionals. For nearly 25 years he was Lancashire's most dependable opening batsman, his best season being that of 1926, when he scored 2,340 runs with an average of 48.75. He has 43 centuries in first-class cricket to his name, including 117 scored in a Test Match in Melbourne during the 1920-21 M.C.C. tour in Australia. Mr. Makepeace is an all-round athlete, for he was a regular member of the Everton football team for a long period, and is one of the select few who have played both cricket and football for England.

Another article of exceptional interest in the issue describes the making of cricket bats. This article is the result of a personal visit to the works of Wm. Sykes Ltd., the largest cricket bat makers in the world, with whose bats Don Bradman has played throughout his career.

Another article on photography deals with snapshotting in general and will be particularly valuable to those who intend to enter the Photographic Competitions. I should like to see many more entries in these contests. No reader, however small his camera, need hesitate to send in prints, for the prizes are not awarded on technical merit alone. What is looked for is real interest of some kind, and a reasonably good photograph that makes an attractive picture will have every chance of winning a prize.

Next Month

There are other splendid articles to follow these in the June and succeeding issues. Mr. L. H. Newman, who is well known to "*M.M.*" readers, will tell how giant silk moths are reared, and a novel contribution will describe exciting rock-drilling contests in the far West of America. An account will be included of a footplate trip on a 2–10–4 locomotive hauling the "*Dominion*," the crack Vancouver-Toronto flyer of the C.P.R., over the tremendous gradients of the Canadian Rockies; and the Short-Mayo Composite aeroplane, the latest product of the ingenuity of the aeroplane designer, will be the subject of another special illustrated article.

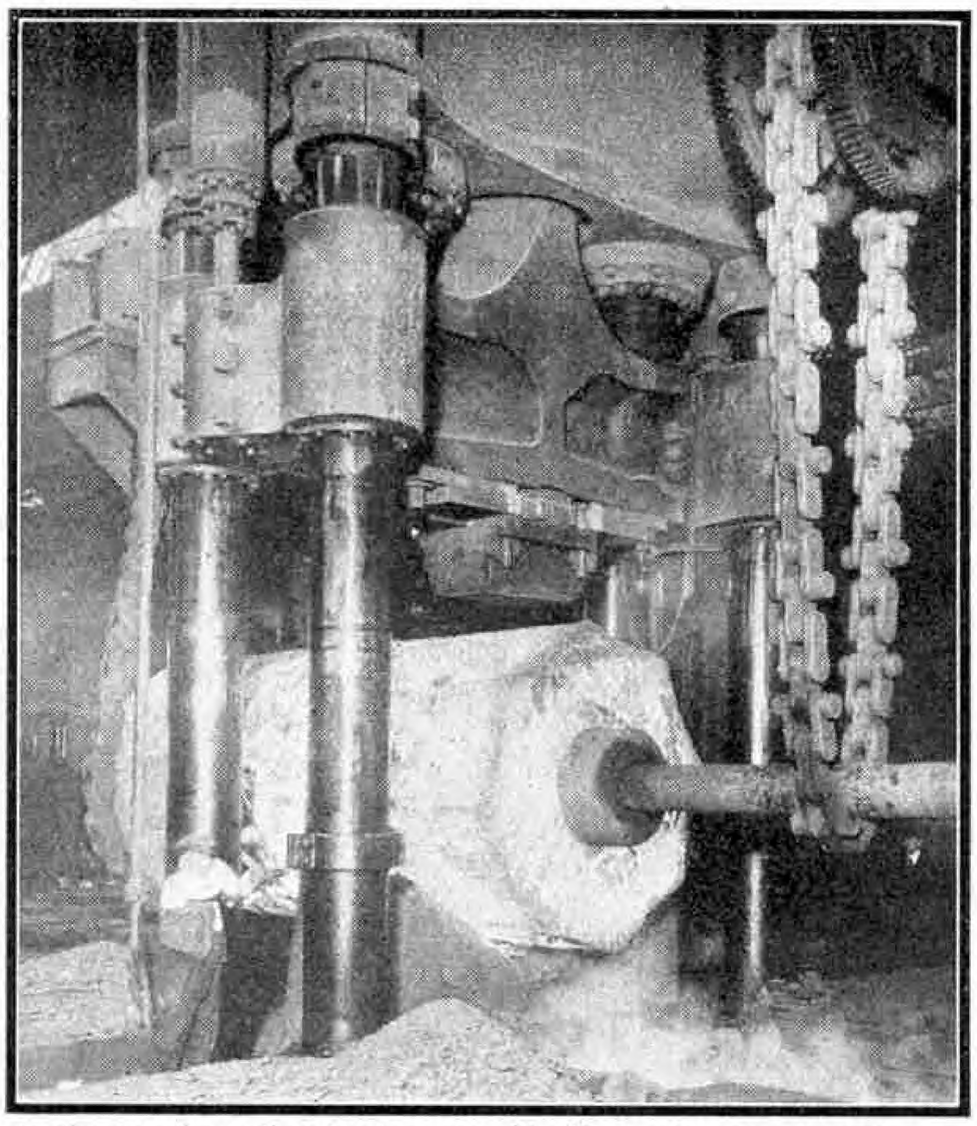
The Production of Hollow Forgings

Huge Ingots Shaped by Hydraulic Presses

THE blacksmith's forge has always had an irresistible attraction for onlookers, who have revelled in the shaping of horse-shoes and other small articles by hammering on the anvil when red hot. The forging of larger articles is far more impressive, however. This is realised at once from our cover illustration this month, which shows a 7,000-ton hydraulic press in the Vickers Works, Sheffield, of the English Steel Corporation producing a large hollow forging from an ingot of steel that has been heated to a forging temperature of from 1,200 to 1,500 deg. C.

It is not uncommon to make forgings of 100 tons by means of hydraulic presses, and recently the 7,000-ton press seen on our cover had no difficulty in handling an ingot weighing 230 tons, which was cast in the largest chilled mould ever made in Great Britain. Many of these large forgings are drums for high pressure boilers, or hollow pressure vessels of various types for use in chemical and oil engineering processes. Every year sees an increase in the demand for these, and they are called upon to withstand ever higher pressures and temperatures in service. For this reason they are forged as far as possible in one piece, and then are stronger than if they were built up of parts riveted together.

The starting point of the forging process is the casting of the huge steel blocks known as ingots. These are made to a shape that is designed to give metal uniform in quality and free from cracks or holes, and the steel of which they are made is usually produced in an acid open hearth furnace, as explained in the article that appeared on page 638 of the November 1937 "*M.M.*"



An ingot under a giant forging press. The illustrations to this article are reproduced by courtesy of the English Steel Corporation Ltd., Sheffield.

When the metal has become solid the ingots are stripped from the moulds while still hot and annealed, after which they are allowed to cool off slowly in a furnace. An alternative is to cool the ingot by leaving it in a cooling pit, and in some cases it is forged into a round or octagonal "bloom" before it is annealed or cooled.

While an ingot is solidifying any impurities in the steel have a tendency to collect together, and thus to form weak spots. Fortunately the bulk of these gather in the part that sets last, which in the case of a solid ingot is the centre or core. In making large hollow forgings the core is removed and thus the less pure material from the axis of the ingot does not find its way into the forging. The header, or lead into the mould, and the bottom end also are cut away, usually by means of a rotary cutting-off machine. That used by the English Steel Corporation for large ingots has a cutter head with two tools, which part off the ends at a cutting speed of 25 ft. per min.

The removal of the core is done by trepanning, the core being cut out by a tubular boring tool. A typical machine used for trepan boring uses two heads, and cuts from both ends of the ingot at the same time. The hole is 2 ft. in diameter, and the core removed measures 1 ft. 7½ in. across. Oil used as a coolant is forced at high pressure through the centres of the cutter bars during the operation.

One of the great advantages of the trepanning method is that it gives an opportunity for examining the end faces and the bore. In addition drillings can be made at each end in various positions from the centre to the outside in order to furnish samples for analysis. These show whether the material of the billet, or remainder of the ingot, is uniform and correct in composition. The time required for cooling is a great drawback, however, and in order to avoid this delay the English Steel Corporation have developed a process of "hot piercing," or in which the hole is punched out before the ingot is cooled.

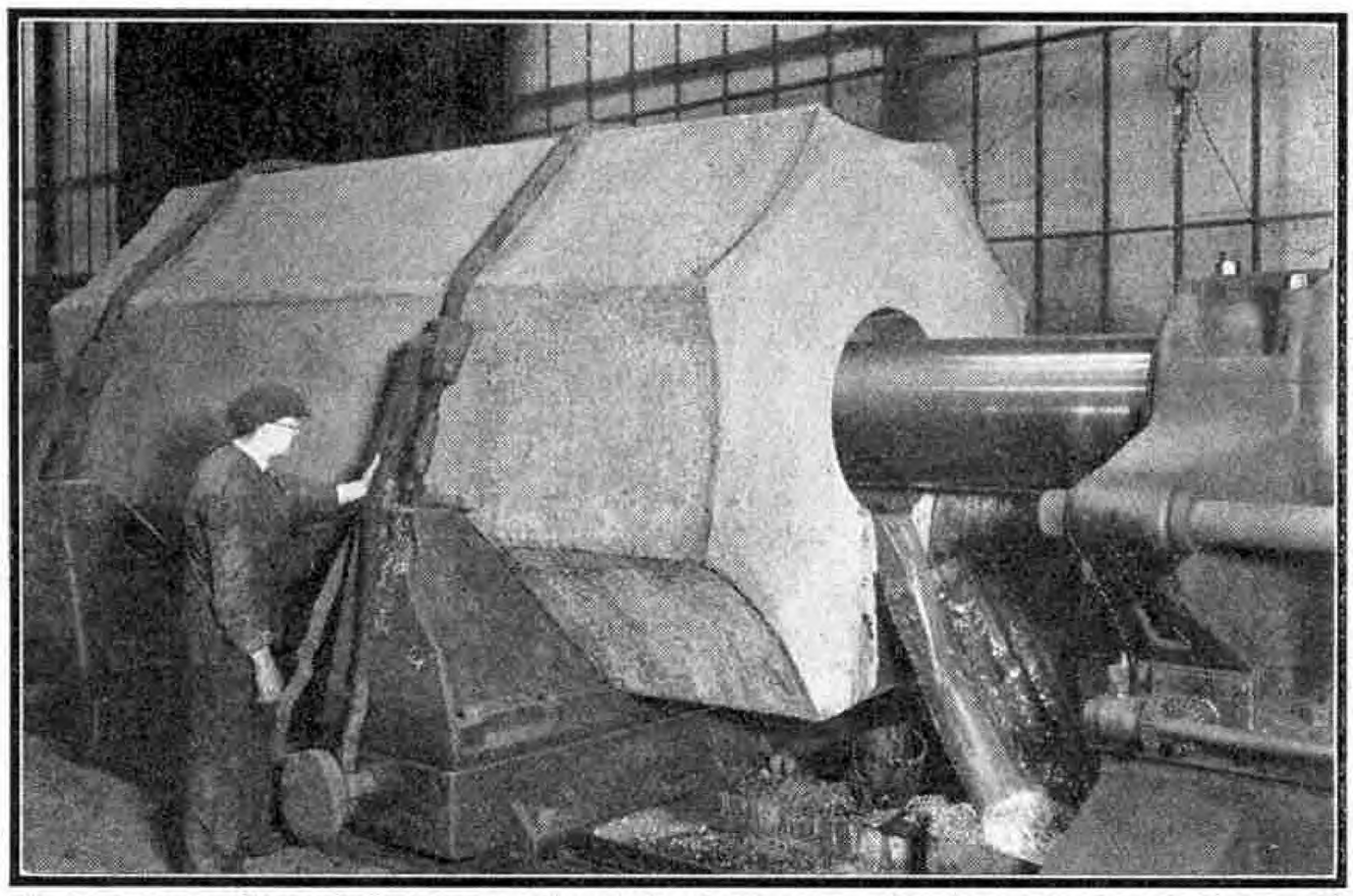
The first forging operation consists of expanding the trepanned hole to permit the entry of a mandrel approximately 2 in. less in diameter than the finished vessel. For this operation the trepanned billet is heated to a forging temperature, first by steam and then in a reheating furnace of suitable size. This furnace consists of a large chamber lined with fire brick that is heated by burning gas, and in it the billet is brought up slowly and uniformly to the required temperature. In most cases reheating may be necessary during subsequent forging, and the mass of metal is then returned to this furnace in order to bring it up to the required temperature. As many as nine heats may be necessary with very large forgings.

The billet is carried by powerful cranes, placed on the anvil of a huge hydraulic press and its wall squeezed between the top tool—a mass of metal shaped like an inverted T—and a bar passed through the billet and supported independently at each end. By repeated squeezes as it is turned round and moved along it is brought to the shape required.

The huge presses used in these operations are wonderful pieces of machinery exerting enormous power and yet being subject to exact and delicate control. The one shown on our cover is an excellent example of a highly efficient modern press, and is the largest forging press in the world operated by a high pressure electro-hydraulic pumping set. Its immense size is suggested

by comparison with the height of the man directing the forging, who communicates his wishes by means of almost imperceptible signs to the men at the levers that regulate the squeezes and the movement of the forging.

The giant columns of this press are 2 ft. 2 in. in diameter and they are 16 ft. 6 in. apart, while the distance between the crosshead carrying the upper tool and the anvil plate below it, that is the space in which a forging is placed during operations, is 17 ft. 6½ in. The press gives 10 strokes per min. with a penetration of 5 in. at full load, and with smaller penetrations the rate of striking can be increased. The speed at which the metal is squeezed is 2 in. per sec.



Trepan boring a 175-ton ingot in preparation for forging it into a tube. During the cutting oil is forced in under pressure through the centres of the cutter bars.

The forging press is operated at these high speeds by means of an electrically-driven 6,500 h.p. high pressure pump. This pump has rams of stainless steel with a diameter of 7¾ in. and a stroke of 3 ft. It delivers water at a normal working pressure of 2½ tons per sq. into the hydraulic cylinder, at the top of the press, in which the forging ram works. This ram has a diameter of 5 ft. and a stroke of 8 ft. 6 in., and the normal total forging pressure is approximately 7,000 tons.

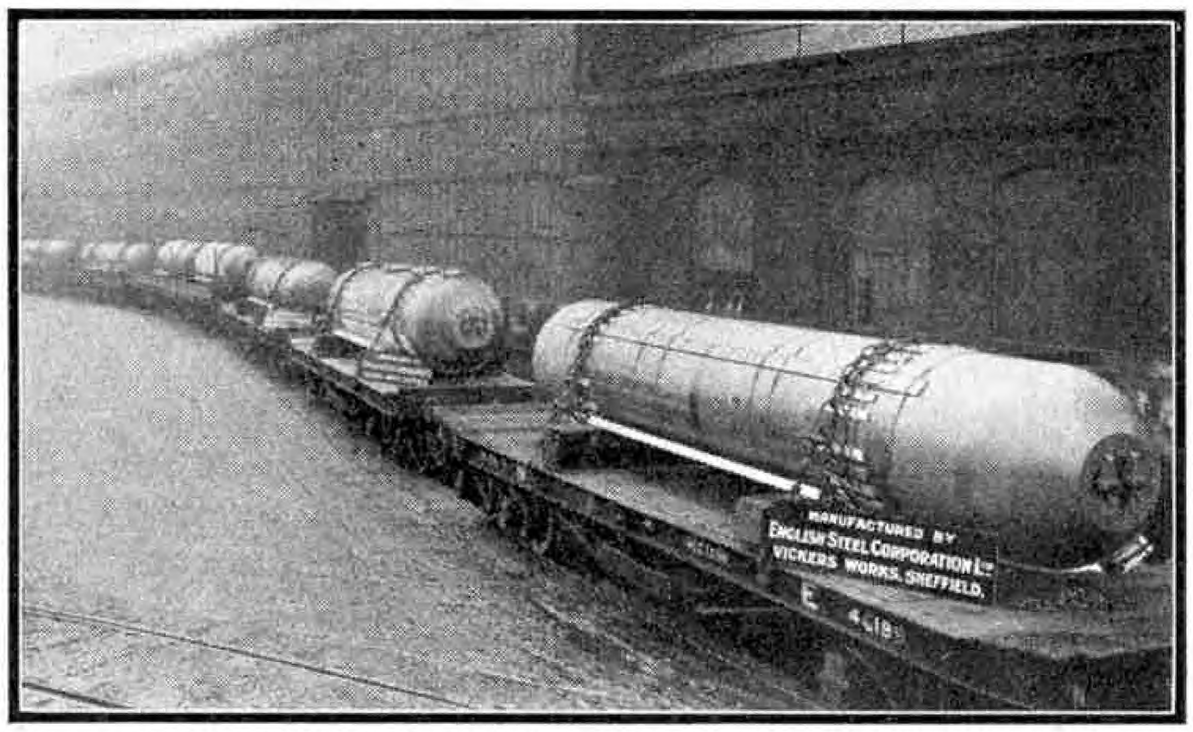
The main forging operations of the press are controlled by means of a single master control or "handing" lever, and any desired working pressure and speed can be employed, a choke valve returning water beyond the quantity required. The control is so delicate that forgings can be gripped in the press as in a vice, without any actual penetration or squeezing taking place.

Three overhead electric cranes of 300 tons, 200 tons and 120 tons capacity respectively are used for bringing forgings to the press and generally for handling them. The largest crane has a hoisting speed of 12½ ft. per min. for a load of 250 tons. There also is an auxiliary hoist with a lifting capacity of 100 tons at 15 ft. per min. that is used for changing the tools and for general work about the forge. Forgings are turned while in the press by means of a bridle chain driven at a speed of 42 ft. per min.

The second forging operation is known as drawing to length. This is carried out in successive "heats," between which the forging is returned to the reheating furnace to bring its temperature to that required. The middle of the billet is forged first, being squeezed down gradually to the required size. The billet is then returned to the furnace, but this time only one end is heated, and the other end, still in the rough state, is usually left outside the furnace. The rate of heating is very carefully controlled at every stage, and precautions are taken to ensure that the work is uniformly heated throughout before forging is proceeded with. Each end in turn is then forged, and it is this stage of the operations that is shown on our cover.

Then comes annealing or heat treatment in a furnace that is similar in type to that used for reheating, but is maintained at a somewhat lower temperature. In this the forging is placed until it is heated throughout to the desired temperature, and it is then allowed to cool slowly and evenly, so that no stresses are set up in the metal by shrinking. The temperature of the steel must be absolutely uniform throughout, and the forging therefore is slowly rotated in the furnace during this annealing process.

The final process is the closing in or "bottling" of the ends. If only one end is to be closed this is done before the machining of the interior, which is afterwards carried out by means of tools passing in through the large or open end. If the forging is to be "bottled" at both ends, however, the work is carried out after the interior has been machined and when the exterior has been roughly finished, and a predetermined excess of metal is left on the ends to enable the closure to be carried out.



Nine completed forged boiler drums, manufactured as explained in this article, leaving the works of the English Steel Corporation for Australia.

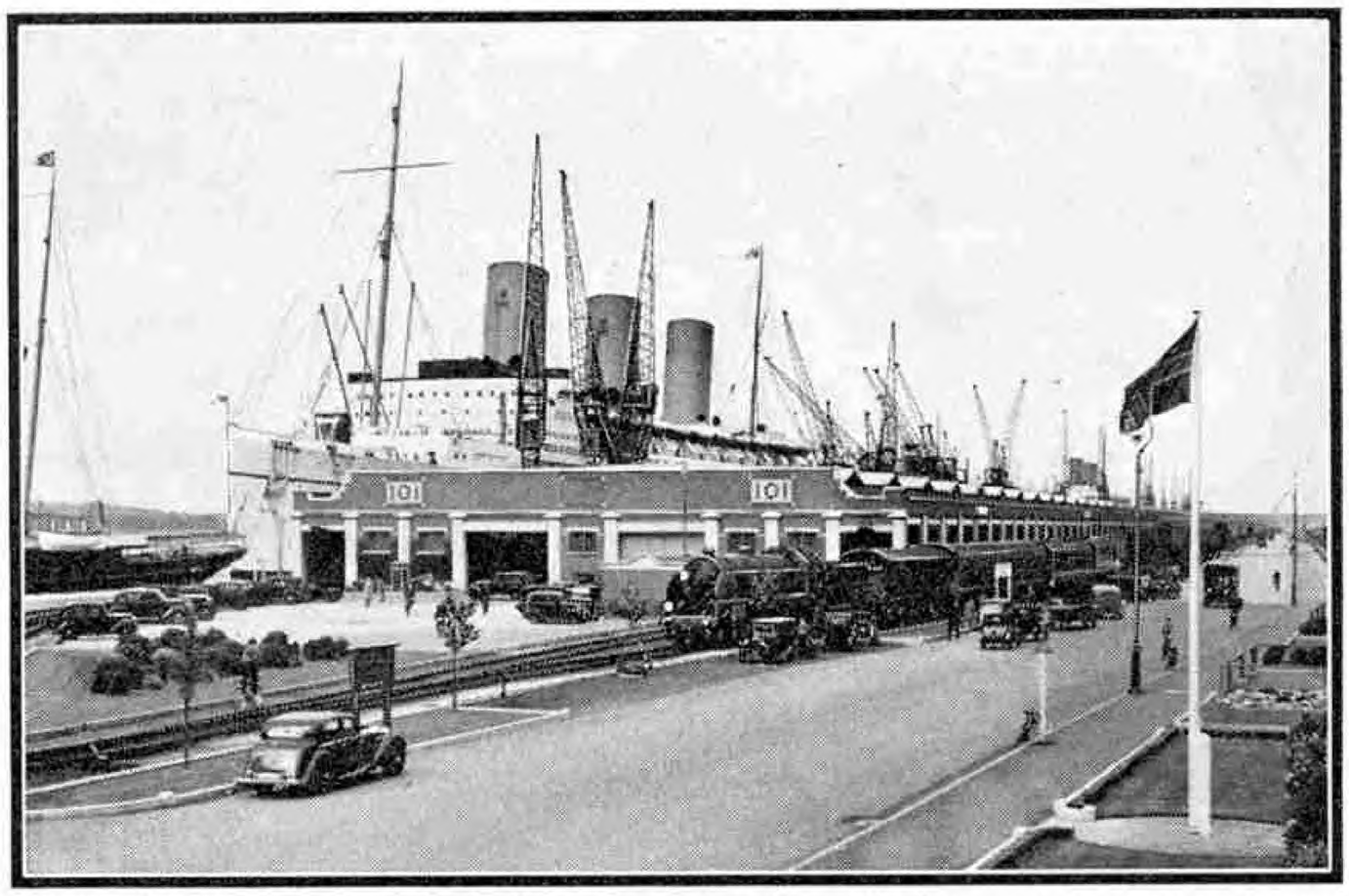
The actual closing of the ends of the forging, at whatever stage, is carried out by placing them between curved tools in the hydraulic press. Slight pressure is applied and this has the effect of thickening the walls of the tube at the sides, and giving a shape that is roughly oval instead of square. The tube is then rotated and the pressing action repeated as rapidly as possible. This process being continued until the final dimensions are reached, leaving a hole small enough to take an oval manhole door. The completed forging is then heat treated and sent to the machine shops where the final machining operations are carried out. The manhole covers are inserted, and the drum is tested by hydraulic pressure, which is always many times that encountered in working conditions. The tube holes are then drilled, and for this work the English Steel Corporation have installed special multiple drilling machines.

The London and Southampton Railway

Developments of a Century

ON the 21st of this month it will be 100 years since the opening of the first section of the London and Southampton Railway, which had been promoted seven years earlier. This pioneer line was subsequently given the more familiar name of London and South Western Railway, and on the grouping of British railways in 1923 it became the Western Division of the Southern Railway.

Southampton owes a great deal of its present-day importance to railway development. Southampton Docks did not come under actual railway management until 1892, but they were in the minds of the promoters of the London and Southampton Railway, for this was put forward under the title of the Southampton, London, and Branch Railway and Dock Company. The idea of building a railway had been preceded by a scheme for a ship canal in order to provide an inland route between Southampton and London, so that shipping could be spared the long Channel passage, in those days a rather risky and troublesome one. The canal scheme was abandoned because of its enormous expense, and unfortunately the dock scheme had to be dropped from the railway undertaking, which secured powers in 1834 for the construction of the line as the London and Southampton Railway.



An interesting scene at Southampton Docks showing an ocean liner at her berth and a boat train on the quay. This and the lower photograph on the next page are reproduced by courtesy of the S.R.

From the first there was close co-operation between the Railway and the Dock Company that had been formed in 1836, and when in 1842 the original Outer Dock was used for the first time passengers and luggage were transferred from the ships' side to trains and conveyed by rail to London. This was the commencement of the service that has developed into the "Ocean Liner Specials" of to-day, linking the Docks at Southampton with the Metropolis.

The first section of the London and Southampton Railway to be opened was from the temporary terminus at Nine Elms, the great goods traffic centre of the present day, to Woking. Other sections followed, and in 1840 the line was opened throughout between Nine Elms and Southampton. Before that occurred, however, the title of London and South Western Railway had been adopted. This step was taken in 1839 in order to overcome the objections of the people of Portsmouth, who wished to be served by the railway but would not have anything to do with a company whose title included the name of the neighbouring rival port!

The station at Nine Elms was near the site of the Vauxhall of the present day and we are told that the spot was previously "studded with windmills and pollard trees, and Dutch-like in appearance." It would be very difficult to discover any such characteristics to-day! Details of the subsequent extension to Waterloo, which occurred in 1848, read rather quaintly now. Four lines of rails were laid down between Nine Elms and Waterloo "in order that we may have no trouble or inconvenience in future in the traffic," as the company's chairman of that time stated. An extension across the Thames was at one time proposed, but nothing came of it. Instead Waterloo grew in piecemeal fashion, to gain the reputation of being perhaps the worst of all stations in which to find trains.

The confusion has now given place to the efficiency of Waterloo as we know it to-day. The reconstruction of the station was completed just before grouping, when the L.S.W.R. handed on to the S.R. the largest station then belonging to a single railway company in the British Isles, covering an area of 24½ acres. Recently the S.R. have found it necessary to carry out extensive works there, including the re-signalling of the station and its approach and the provision of a fly-over line as far out as Wimbledon, in order to deal efficiently with present-day traffic.

Gradually the L.S.W.R. system developed in accordance with the promise of its name, reaching Salisbury from Worting Junction in 1857 and Exeter in 1860. There were thus two main lines, the original one to Southampton, which was subsequently extended to Dorchester, and the West of England line to Exeter. The penetration into what were regarded as G.W.R. preserves caused some competition between the two companies, but it was not until 1890, when the South Western obtained a through route to Plymouth, that competition for traffic to the West became really acute.

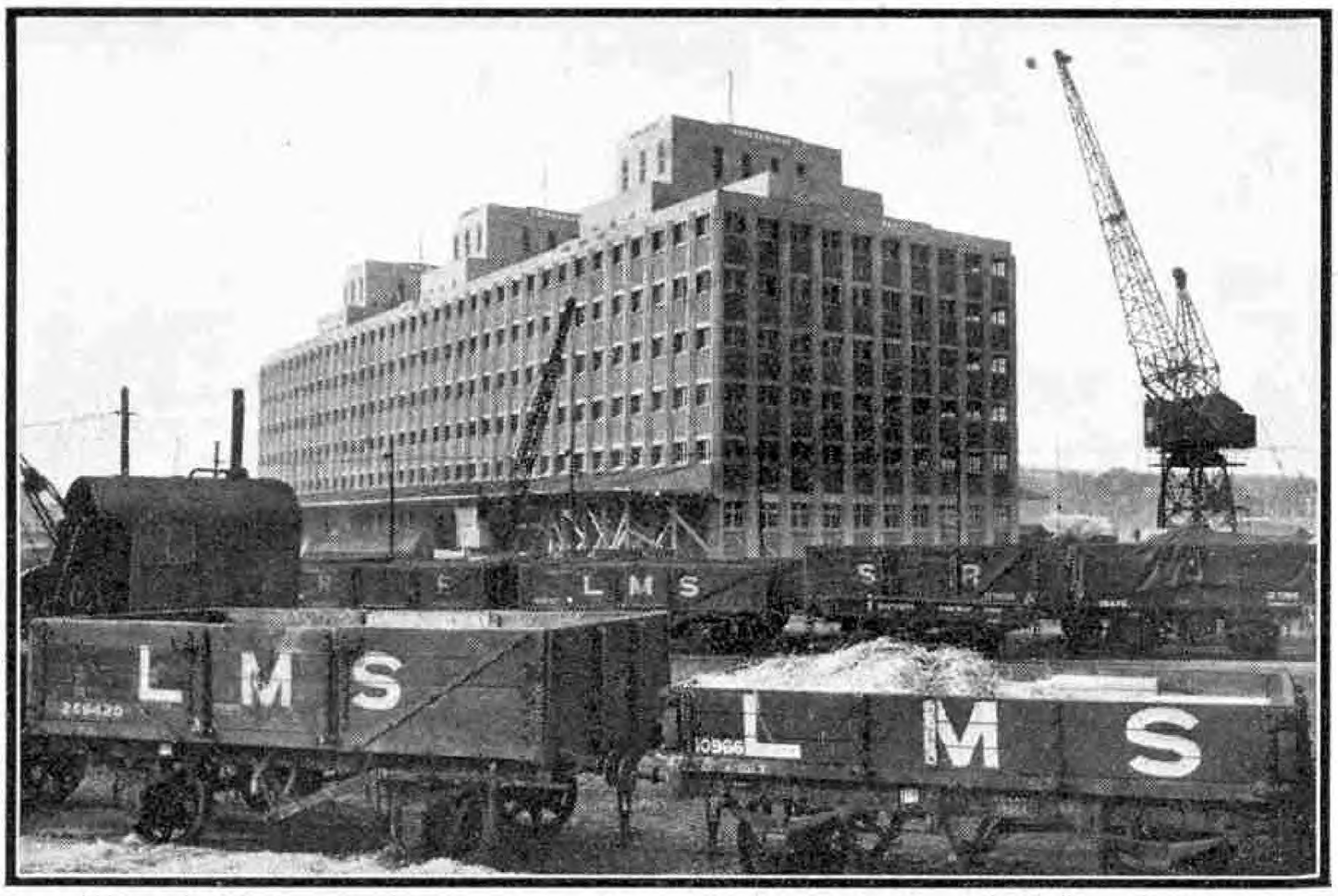
It must be admitted that for many years the South Western was a somewhat slow line, although the trains were heavy owing to the large traffic. The Exeter services in competition with those of the G.W.R. were fairly respectable in regard to speed, however, and it was the L.S.W.R. Exeter trains that inspired the introduction of the "*Flying Dutchman*" of the G.W.R.

In 1883 the fastest and longest runs on the L.S.W.R. line were made by expresses between Yeovil Junction and the platform at Exeter where tickets were collected, 48½ miles being covered at an average speed of 46.2 m.p.h.

A later phase of the competition between the two companies involved the traffic to and from Plymouth to connect with Atlantic liners calling there. The G.W.R. carried the mails landed and the L.S.W.R. conveyed the passengers, and some spirited running was made on these services in the early years of the present century.

A further development was the opening of the Bournemouth services as we have them to-day. These really began with the opening in 1888 of a line from Brockenhurst to Christchurch, which with the connection of the two stations in Bournemouth founded a shorter route to and from London than had previously been available. In that year there commenced to run the 12.30 p.m. from Waterloo to Southampton and Bournemouth, the total time for the journey, including two stops, then being 2 hr. 57 min. The 12.30 p.m. of to-day, one of the popular modern fleet of fast trains operated on this service, is thus a direct descendant of the best train on the route 50 years ago.

In the earliest days of the London and Southampton line it was thought that five locomotives would be sufficient for the traffic! From this modest beginning there sprang a notable line of engines designed by engineers famous in locomotive history, including the two Beatties, father and son, W. Adams, D. Drummond, R. Urie, and in more recent years R. E. L. Maunsell. Designs have alternated between complication and simplicity. The two Beatties were locomotive economists of a high order at a time when locomotive experimenting was more or less a hobby for the engineers responsible, and various kinds of apparatus and appliances being fitted by them on L.S.W.R. engines. With the appointment of W. Adams as Locomotive Superintendent there followed a period of more orthodox designs. Then under D. Drummond four-cylinder propulsion, fire-box water tubes, boiler feed pumps, spark arresters and other devices were the fashion.



Part of Nine Elms to-day, showing the new warehouse and granary recently erected by the S.R. The original passenger terminus of the London and Southampton Railway was at Nine Elms.

It was during this period that Eastleigh Locomotive Works became established, and the engines produced there under R. Urie and R. E. L. Maunsell have been notable for their simplicity yet sound design and efficient working.

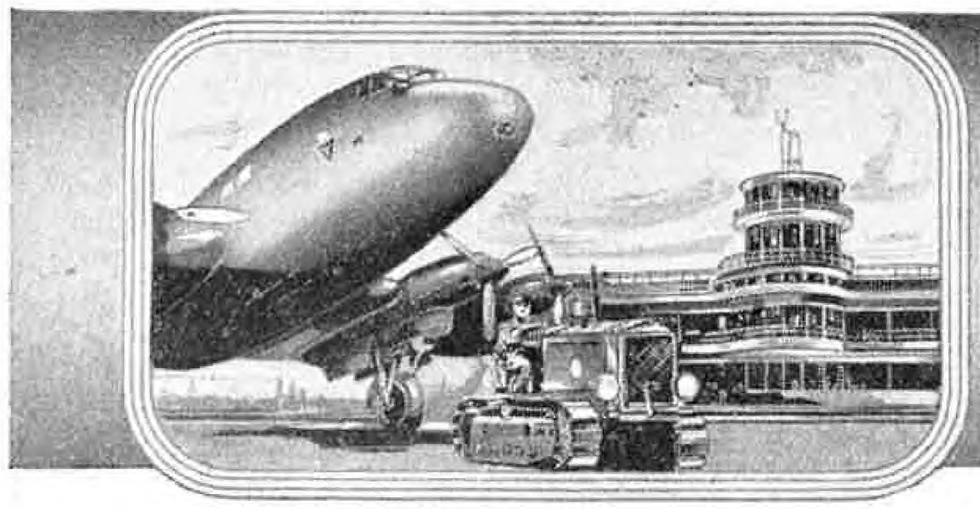
In spite of the variations in practice due to the ideas of individual engineers certain characteristics have marked the locomotive designs of the L.S.W.R. and, to a slightly less extent of those of the S.R. For instance, it was long the practice to provide engines for the heavily-graded sections west of Salisbury that had smaller driving wheels than those used east of that point. Again, as there was no heavy freight traffic owing to the absence of big industrial areas, it has been the policy to build large numbers of engines of a "mixed-traffic" character, which could deal satisfactorily with most freight duties and also could be used with advantage on the majority of passenger trains. Since grouping took effect the only engines of a definitely goods character that have been built are the recently introduced 0–6–0s which were described in the March *"M.M."* of this year. Until the electrification era, too, a regular army of tank locomotives were necessary in order to deal with the intense suburban traffic in the neighbourhood of London.

The present S.R. electrification may be said to have been commenced by the former L.S.W.R., for from 1915 onwards an extensive suburban electrification was being operated from Waterloo even before grouping. The extent of this system no doubt largely accounted for the decision of the Southern Railway to adopt the same method of traction, employing a third rail outside the running rails and carrying direct current at 600 v.



One of the numerous quayside cranes unloading citrus fruits at Southampton. It is interesting that "foreign fruits" were among the traffic anticipated in the original estimates of the London and Southampton Railway.

Increasing trade made extensions necessary and led to Southampton becoming a railway port. An important step in its development was the opening in 1911 of the present Ocean Dock, then the White Star Dock, as a result of the transfer of the White Star Line New York service from Liverpool in 1907. This opening provided the starting point of the remarkable developments of recent years, such as the King George V Graving Dock and the Docks Extension.



AIR NEWS

Novel Single-Blade Airscrew

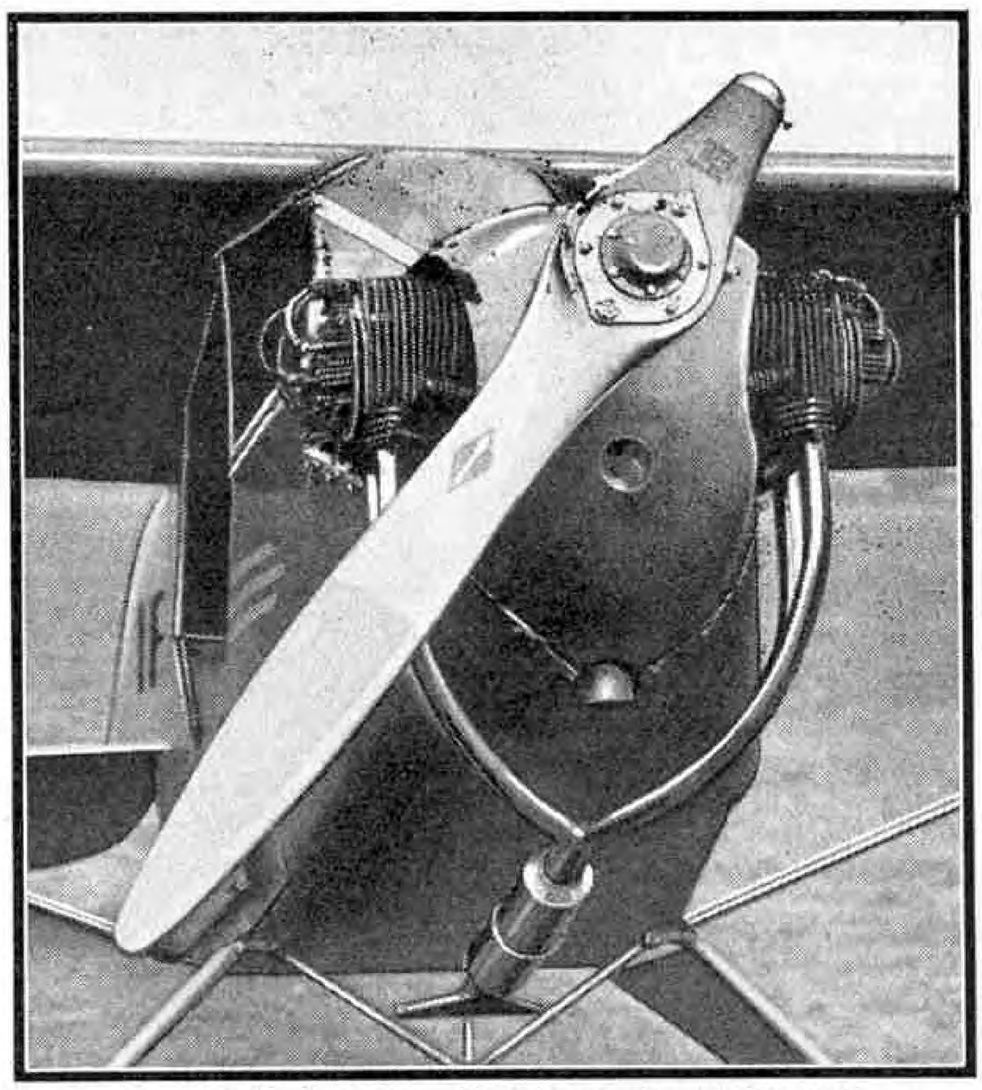
At first sight the aeroplane shown in the illustration on this page appears to have only half a propeller. The lack of a second blade is intentional, however, as this is a single-blade propeller produced by the Everel Propeller Corporation of Baltimore in the United States. It is shown fitted to a Taylor "Cub" light monoplane. In a recent demonstration at Hanworth Aerodrome this aeroplane took off in 30 to 40 yards less than another "Cub" that was fitted with an ordinary two-bladed airscrew. The "Cub" with the Everel propeller also climbed more speedily, and it is claimed that the use of the new airscrew increases the rate of climb, cruising speed and general efficiency of an aeroplane by a considerable margin.

The greater efficiency of the Everel airscrew is due largely to the fact that its single blade works in undisturbed air. In the case of a two-bladed airscrew each blade has to work in air disturbed by the other one, and thus is only partly effective, with the result that the overall efficiency of the airscrew is reduced.

A specially designed method of attachment makes the Everel propeller one of the automatically variable pitch type. When an aeroplane fitted with it is about to take off, the throttle is opened and the load automatically brings the blade into the required fine pitch position. As the aeroplane moves forward the load on the blade decreases and the propeller tip moves towards the normal position, the effect of this being to twist the blade to give a coarser pitch on attaining cruising speed in level flight. The less the thrust or load is in comparison with the centrifugal force (the centrifugal force remains constant with constant revolutions of the propeller), the more the blade is moved back to give yet coarser pitch, automatically setting itself in the most efficient position.

It is claimed that the Everel airscrew has several important advantages over other controllable pitch types. In addition to working entirely automatically, it can be fitted to any aero engine, whereas other controllable pitch airscrews require specially developed engines incorporating expensive electrical or oil pressure controls to work the airscrew. It is much lighter than other controllable pitch airscrews, owing to its simple design and the fact that no controls, or special oil or electrical systems, have to be incorporated in the engine and aircraft to which it is fitted. It can also be produced more cheaply than an airscrew with two or more blades.

For the foregoing details we are indebted to W. S. Shackleton Ltd., of London, who are the European agents for the manufacture and sale of Everel airscrews.



The Everel single-blade airscrew fitted to a Taylor "Cub" light monoplane. This illustration and the upper one on the opposite page are reproduced by courtesy of "The Aeroplane."

New Alvis Aero Engine

The Alvis company, of Coventry, have added another aero engine to their extensive range. The newcomer develops about 400 h.p. and is of the air-cooled type, with its nine cylinders arranged radially in a single bank. A short piston stroke is used, in order to keep the diameter of the engine as small as possible. The various accessories, including the magnetos, fuel pump, air compressor, and starter, can be mounted upon the back of the motor or upon a separate unit, and driven through a gear-box and extension shaft. The overall length of the engine with the accessory unit mounted on the back of it is 52 in., and the overall diameter is 41½ in.

Preventing Ice Formation Electrically

Attention continues to be given to devising effective means of preventing ice formation on the wings of aircraft, and an electrical method of achieving this was demonstrated recently in this country. In this system the leading edge of the wings is coated with a colloidal metal paint, and when de-icing becomes necessary an electrical current of 25 volts, supplied by a small motor, is passed through the paint, heating it to an extent that prevents ice formation. Although the paint may be raised to a temperature as high as 600 deg. C. by the current, it is not damaged in any way. It is stated that this method can be used just as successfully for protecting other important parts of an aeroplane.

More Records by Flying Officer Clouston

Flying Officer A. E. Clouston, of the Royal Aircraft Establishment, Farnborough, who in November last flew to Capetown and back in record time, has added to his magnificent air achievements by flying with Mr. V. Ricketts, of the *"Daily Express,"* to New Zealand and back, a distance of 24,000 miles, in 10 days 21 hrs. 22 min. By this fine double flight he completed the first direct round trip to New Zealand and back, and cut three days off the England-Australia-England record of 13¼ days achieved by Cathcart Jones and Ken Waller in a D.H. "Comet" in 1934. He made the flight to New Zealand in less time than the solo record flight of Miss Jean Batten in October 1937, and on his return trip exceeded her record time for a Port Darwin-England flight. He also set up new records for a flight from Port Darwin to Sydney, and between Sydney and New Zealand, in both directions.

Clouston and Ricketts flew the famous D.H. "Comet" used for the former's Capetown trip. This was the aeroplane in which C. W. A. Scott and the late T. Campbell Black won the England-Australia air race in October 1934, by flying from Mildenhall to Melbourne in 2 days 23 hrs. 18 sec., and Clouston was out to beat that record.

A start was made from Gravesend on 15th March. The weather was unfavourable, headwinds all the way slowing down the "Comet," and in spite of only necessary halts for refuelling Australia was reached several hours behind Scott and Black's time. The airmen therefore flew on to New Zealand, crossing the Tasman Sea to Blenheim in the record time of 7 hrs. 27 min., which was nearly 2 hrs. less than the crossing made by the Imperial Airways flying boat *"Centaurus"* during its survey flight to New Zealand. The flight from England to New Zealand had taken only 4 days 8 hrs. 37 min.

Next morning the airmen set off back to England, re-crossing the Tasman Sea to Sydney, in 8 hrs. 31 min. Continuing by way of Darwin, Singapore, Calcutta, and Karachi, they landed at Basra on the 25th March during the opening by King Ghazi of the new airport. After further stops on the way home they arrived at Croydon next day, having covered the 3,300 miles from Basra in 19 hrs., and flown from New Zealand to England in 5 days 20 hrs. 12 min. The return flight was made in better weather than the outward one, although conditions over the Mediterranean were very cold, and strong cross winds were encountered after leaving Cairo.

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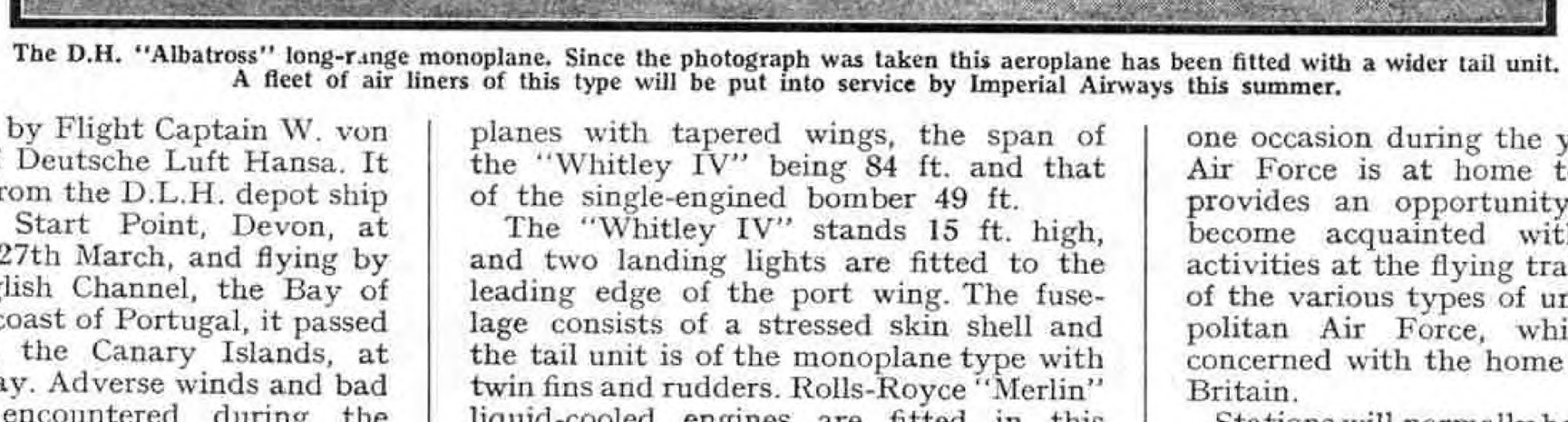
The Imperial Airways flying boats *"Cambria"* and *"Caledonia,"* used for the North Atlantic flights last year are being equipped for service on the Empire air routes.

Record South Atlantic Flight by Diesel-engined Flying Boat

Italy has not been permitted to hold the world's distance record for seaplanes very long. On 27th-29th March last the Dornier Do.18 flying boat shown in the lower illustration on this page flew from a point off the south coast of England to Caravellas, in Brazil, a distance of 5,219.8 miles. This was about 870 miles more than the distance flown by the Italian Cant Z506B seaplane that wrested the record from France at the end of last year.

The Do.18 carried a crew of four, and was commanded by Flight Captain W. von Engel, a pilot of Deutsche Luft Hansa. It was catapulted from the D.L.H. depot ship "*Westfalen*" off Start Point, Devon, at 2.5 p.m. on the 27th March, and flying by way of the English Channel, the Bay of Biscay, and the coast of Portugal, it passed Las Palmas, in the Canary Islands, at 2.30 a.m. next day. Adverse winds and bad weather were encountered during the crossing of the South Atlantic, but the island of Fernando Noronha, 230 miles off the coast of Brazil, was reached by 1.50 p.m. Pernambuco was passed at 1.5 a.m. on the 29th March, and eight hours later the flying boat alighted in the harbour of Caravellas, being short of fuel to continue to Rio de Janeiro, 480 miles farther on, as had been intended. The distance of 5,219.8 miles had been covered in 43 hours.

The special interest attaching to this flight is that it was made with Diesel engines using heavy fuel that is practically non-inflammable. The engines were Junkers "Jumos" of the latest design, and it is claimed that the flight was only possible because of their exceptionally low fuel consumption.



The D.H. "Albatross" long-range monoplane. Since the photograph was taken this aeroplane has been fitted with a wider tail unit. A fleet of air liners of this type will be put into service by Imperial Airways this summer.



The Dornier Do.18 Flying Boat that accomplished the record South Atlantic flight described on this page. Photograph by courtesy of Dornier Metallbauten G.m.b.H., Germany.

Improved Performance of D.C.3 Air Liner

The high cruising speed of 207 m.p.h. was attained by a Douglas D.C.3 air liner during a recent one-stop flight from Los Angeles to Chicago. The air liner was fitted with two of the latest type of Pratt and Whitney "Twin Wasp" radial engines, and attained this cruising speed at only 54 per cent. of full engine power. It was then flying at 13,000 ft. The D.C.3 was flown by Mr. B. Howard, research pilot of United Air Lines, the owners of the machine.

The Latest Armstrong-Whitworth Bombers

Some general details of the Armstrong-Whitworth "Whitley IV" twin-engined heavy bomber and a single-engined day bomber as yet un-named are now available. Both are middle wing cantilever monoplanes with tapered wings, the span of the "Whitley IV" being 84 ft. and that of the single-engined bomber 49 ft.

The "Whitley IV" stands 15 ft. high, and two landing lights are fitted to the leading edge of the port wing. The fuselage consists of a stressed skin shell and the tail unit is of the monoplane type with twin fins and rudders. Rolls-Royce "Merlin" liquid-cooled engines are fitted in this machine. The retractable undercarriage is controlled by two hydraulically-operated units mounted beneath the engine nacelles, and the wheels retract immediately behind the engines. The crew of five consists of a pilot, navigator, radio operator, and two gunners.

The smaller aircraft also has a retractable undercarriage. It is fitted with an Armstrong-Siddeley "Tiger VIII" engine, which drives a three-bladed controllable pitch airscrew. There are places for a pilot and an observer. This light bomber is 43 ft. 10 in. long and 13 ft. 3 in. high.

The performance details of these middle wing aircraft are awaited with interest.

Empire Air Day

The fifth Empire Air Day will be observed at 58 stations of the Royal Air Force on Saturday, 28th May. This is a larger number of stations than has previously been available for inspection, the increase being due to the expansion of the service that is now proceeding. Fifteen civil aerodromes at which personnel are being trained for the Royal Air Force, the Auxiliary Air Force and the Royal Air Force Volunteer Reserve, will also be open.

Empire Air Day, which is organised in conjunction with the Air League, is the one occasion during the year in which the Air Force is at home to the public. It provides an opportunity for visitors to become acquainted with the life and activities at the flying training schools and of the various types of units in the Metropolitan Air Force, which is primarily concerned with the home defence of Great Britain.

Stations will normally be open from 2 p.m. until about 7 p.m. The programme at each station includes flying displays provided by the local units, supplemented, in many cases, by demonstrations by aircraft from other stations. Several types of aircraft will be available for inspection at most stations, and the workshops, hangars, messrooms and barrack-rooms will also be thrown open to the public.

The importance of Empire Air Day this year is increased by the fact that there will be no Royal Air Force Display at Hendon. There will therefore be no other opportunity for the public generally to see the work of the Royal Air Force.

Admission for adults is 1/- and for children 3d. The profits will be allotted by the Air Ministry to charitable and philanthropic objects.

South African Air Regulations

In South Africa it has been made compulsory for air liners seating more than 10 people to be equipped with radio, and if they regularly fly higher than 15,000 ft. they have also to carry a supply of oxygen. Air liners engaged on non-stop flights of more than 100 miles by day or 16 miles by night must have a licensed navigator on board. The pilot must not be the navigator unless a second pilot is carried.

CRICKET! HOW TO IMPROVE YOUR GAME

By Harry Makepeace (Lancashire County Cricket Club Coach)

ANOTHER cricket season is now commencing and every enthusiast is full of expectations. Is it going to be a good one for England, or will the Australians, who have just arrived, retain the Ashes?

An Australian visit is a great tonic for English cricket, but I don't think we work up quite the same enthusiasm for the Tests at home as they do "down under." I wish some of my readers could visit either Melbourne or Sydney cricket grounds during a Test Match; forty thousand people of all ages and both sexes, sitting five or six days under a broiling sun, watching every ball bowled! They come hundreds of miles, squatters and ranchers from the back blocks taking perhaps a week to make the journey; the excitement is so intense that one must really see it to realise it.

For the present, however, I want to give some coaching advice and hints to youngsters on how to play, rather than to deal with first-class cricket.

It does not follow that because a boy has not received coaching he cannot achieve proficiency at cricket. Several of the best players received no professional advice in their early days. Jack Hobbs played at Parkers Piece, Cambridge, with the other boys of his own age, and Wilfred Rhodes used to bowl for hours in the winter time at a stick on a waste ground, trying to obtain command of length and spin.

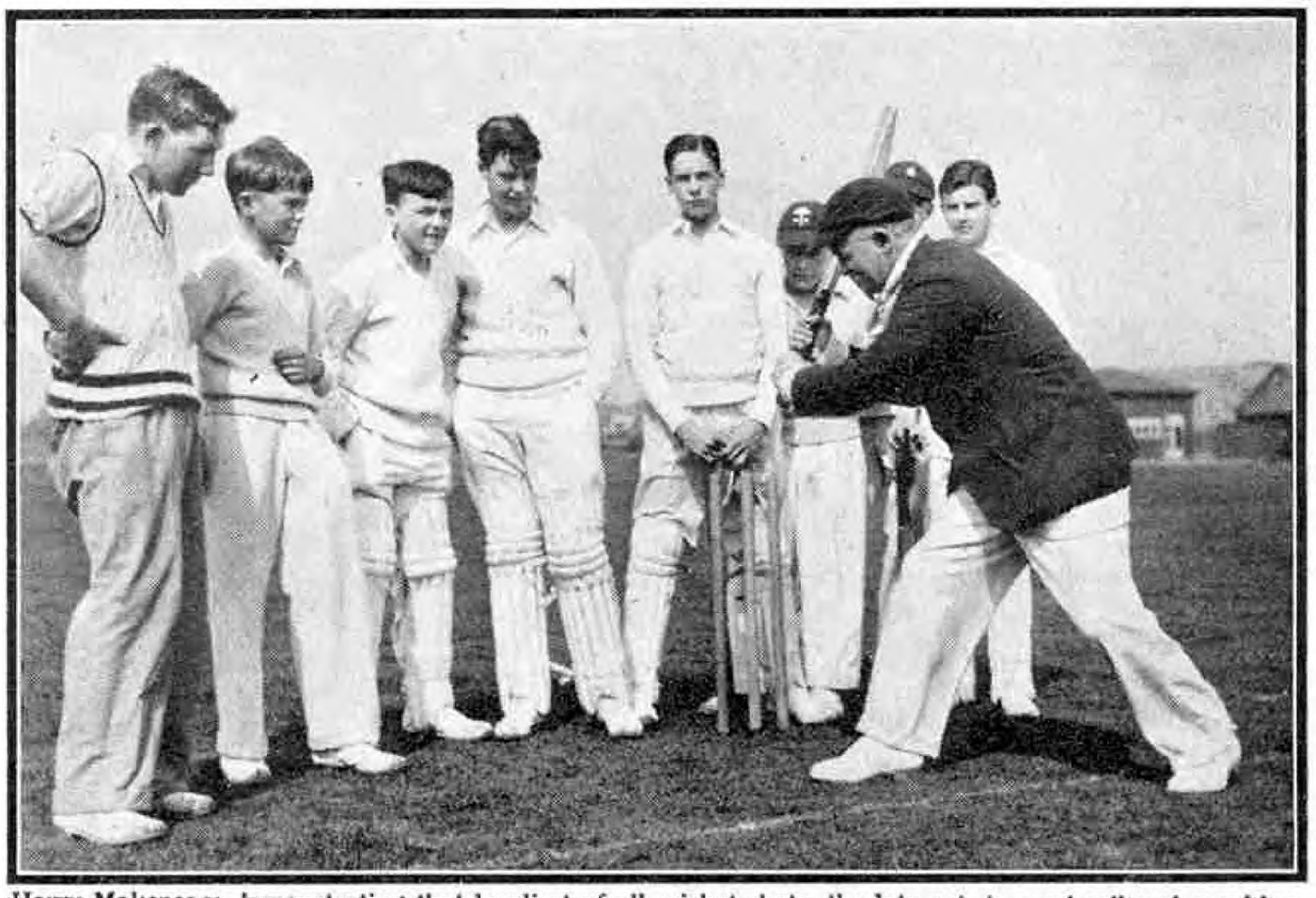
Coming to my own cricket career, you will no doubt be amused to hear that my early school of cricket was in our back yard, which was about 14 yards long. Every season, until I could go elsewhere, I spent hours under the tuition of my father in that yard, having the ball thrown at me, the pitch being too short to bowl! My father was a fair club cricketer, and my first lessons were how to play a straight bat forward, then to play back; then the strokes were learnt and many a crack on the shin I received learning to stand up to play them off my legs.

That old cricketer was right when he said there are three things to make a cricketer, Practice, Practice and Practice.

Now to give some general advice on how to improve your batting.

There is a tendency among young boys to use a bat much larger than necessary. I have had youngsters bringing a full size bat belonging to Father, thinking it wonderful to use it. Now this is all wrong. A boy of, say, twelve, wants a size 4 or 5 at the most; one he can use easily. Young wrists are not strong enough to hit a ball hard with a big heavy bat, and it is in the blood of every healthy young human to hit something. If your bat is not the right size and weight you won't be able to give the ball the punishment it requires.

Learn to hold the bat correctly, both hands close together, left hand about an inch from the top of the handle, back of left hand facing mid-off. Don't hold one hand at the top and the other at the bottom of the handle, one hand is pulling against the other.



Harry Makepeace demonstrating that loveliest of all cricket shots, the late cut, to a schoolboys' coaching class. Notice how the rear foot has been carried across to the line of the ball's flight and how the face of the bat is shaping to come right on top of the ball at the moment of contact.

Stand easily at the wicket, with left shoulder down the wicket and not round to square leg. Chest should be facing point or cover.

I cannot undertake in the space at my disposal to go into details of every individual stroke, but will give a few hints on the fundamental things for boys to learn.

Stand up to your wicket, and don't draw away on the leg side. Left elbow well forward towards the bowler when playing forward, left elbow well up when playing back, and try to force the ball away hard if possible. Your left foot must be close to the ball when playing forward, and your right leg close to the line of the ball when playing back.

It is essential that you move your feet quickly to get into position to make a stroke; no player will attain great heights unless he learns to use his feet quickly.

Keep your head down when making a stroke, and keep it still even for a few seconds afterwards.

Attack as much as possible and hit the ball hard. Get on top of the bowlers, few of them bowl as well when being hit as they do when taking wickets.

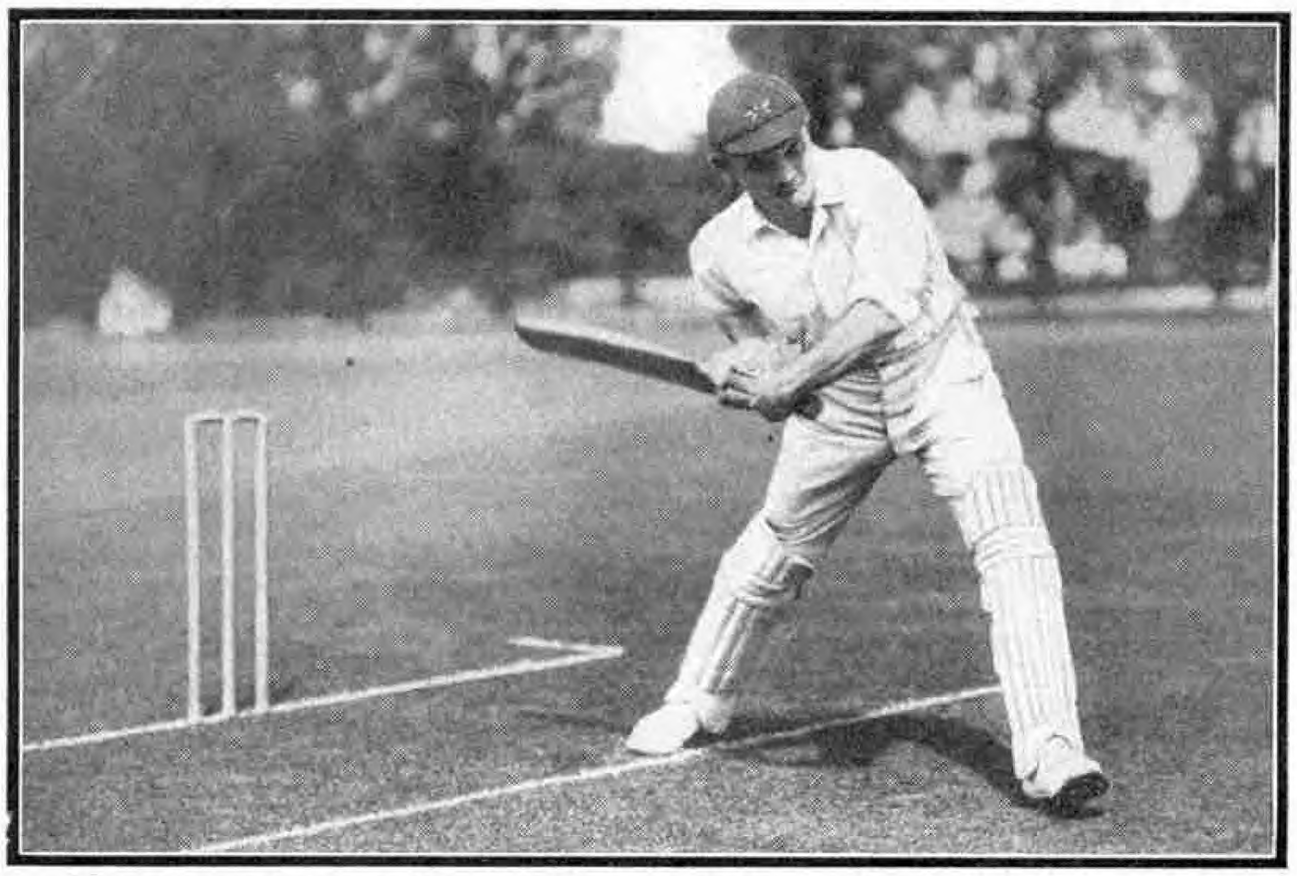
Just one golden rule—don't hit against the break in a leg break, and don't hit across a good length straight ball.

Coming now to bowling; some good judges have said that bowlers are born, not made. To a certain extent this may be true, but what I think they really meant was that the bowler has to learn most of his craft quite by himself. I will try, however, to give a few tips to those boys who hope to be the Larwoods, Parkins or Freemans

of the future.

The first thing a young bowler must learn to do is be sure of his direction and length. How many of you can hit the wicket three times out of six when no batsman is there, or if an open newspaper is laid down on a good length, can hit that three times in an over? I am afraid you would find it impossible. Still, bowlers who have gained prominence have spent hours and hours bowling away at a place they have marked on a wicket, and perhaps after years their efforts have been rewarded.

Now a few words for boys of 12 years of age. Don't try and bowl with a full-size ball, and don't bowl 22 yards. Get a boy's ball and bowl 20 yards; you will get the feel of the ball better and be much more accurate than if you use a full-size ball.



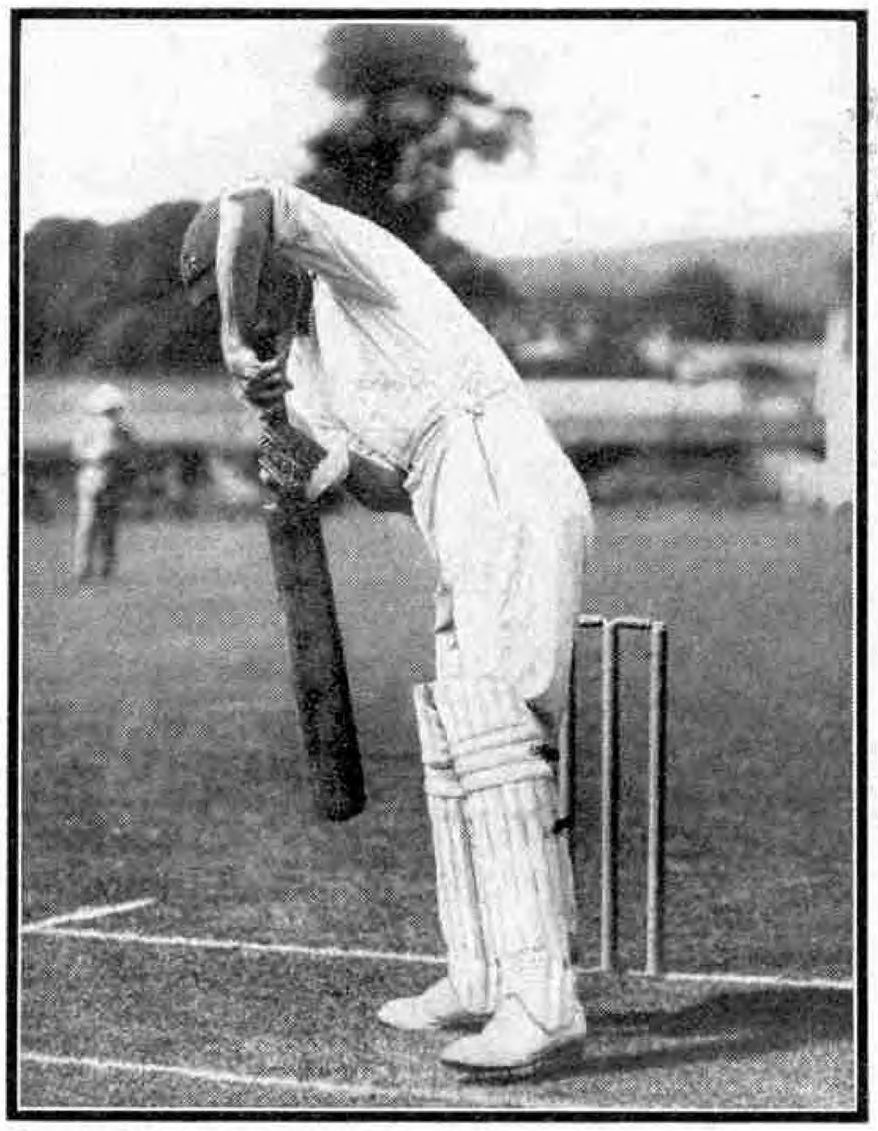
Playing forward. This shot is the basis of all attacking strokes in front of the wicket.

Learn to take a nice easy run to the wicket; not too long unless you are a fast bowler, when you must run a dozen paces or you won't get the life out of the wicket you should do.

Learn to stand up when delivering the ball, and keep the ball out of sight of the batsman as long as possible. Start your bowling hand from behind your right buttock, and try and cultivate a sideways delivery.

I want to stress the point that you never will be any good until you have learnt to bowl a length, and this involves constant practice. The finer arts of the bowler such as spin, flight, swerve, are of no use until you have mastered length. Having done this, then the problems and possibilities of a ball associated with curve, spin, break, twist and flight are endless, the subject of some very close thinking. These later points are not for the young bowler, however.

Master the main items I have written about and then, when in action in a match, study the batsman and try to find his weakness and bowl accordingly. One batsman might be strong on the offside, another strong on the legside; one might be a great driver and the other not able to drive at all.



Harry Makepeace is seen here playing a defensive back stroke. Notice that the rear leg has been carried back in line with the ball and that the head is well down over the bat.

Mr. A. C. MacLaren once gave the young professionals at Old Trafford a good lesson on studying batsmen. One came in whom nobody had ever seen. After two or three balls from the slow bowler, who always had two outfields, Mr. MacLaren said to the bowler; "Bring those two men in from the country, this batsman cannot drive." He knew this was true from the batsman's stance and the way he held his bat. It was very sound advice, and when it was explained to the young pros. they saw the reason why.

So now, you young bowlers who want to reach the top flights, it means practice and study and plenty of it. Even at the present day I know young county bowlers who carry a ball in their pockets during the winter just to keep the feel and touch and fingers flexible.

Now to come to what is nearly, if not the most important part of cricket. I have heard it said that big scores cannot be made against brilliant fielding sides. I know good fielders will make a poor side into a good one, and bad fielders will let any side down. Some cricketers enjoy fielding better than any other part of the game; in my young days I have fielded from 11.30 to 6.30 and enjoyed every minute of it. If he can make a good catch or two and save runs, what more could a healthy young boy require?

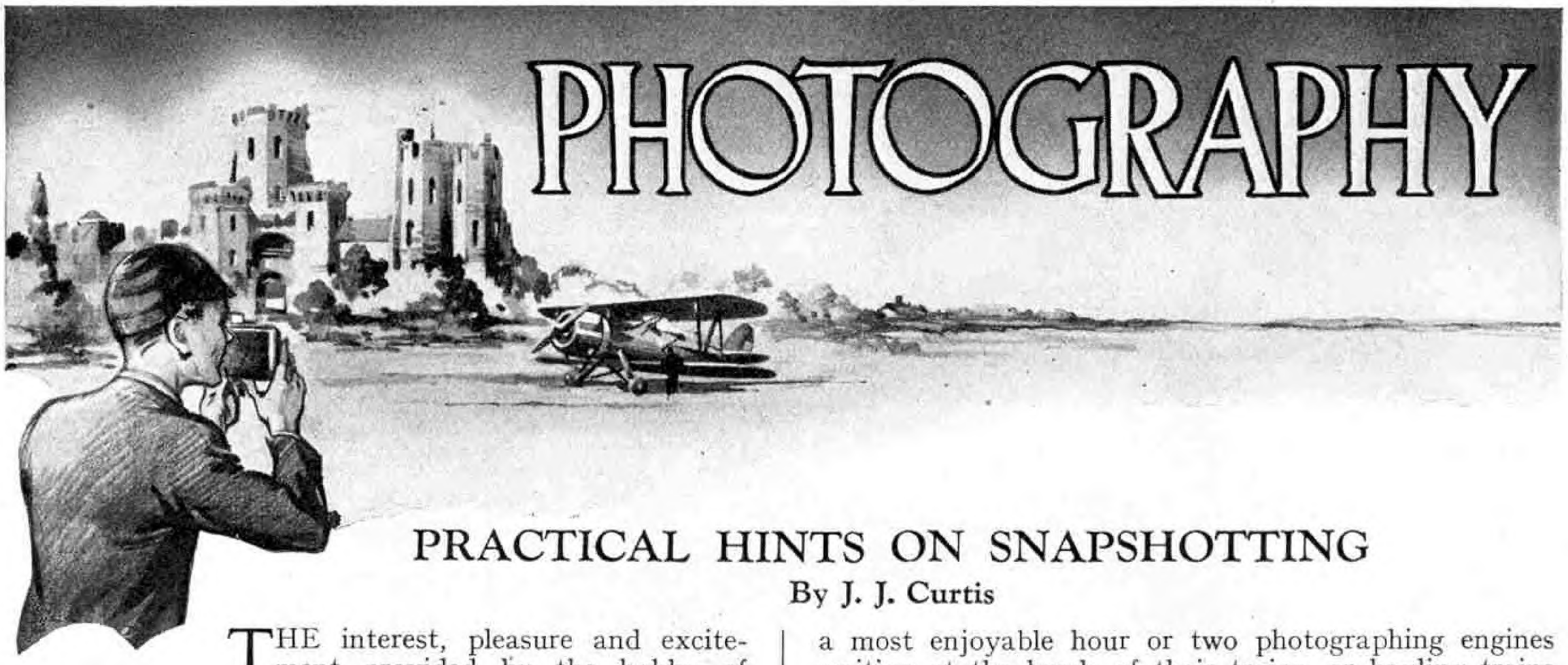
Fielding is one department of the game in which one cannot do a great amount of coaching; as long as a boy has good eyesight, and a sense of time and direction, it is just a question of practice.

I was very interested a couple of years ago, while captaining the Lancashire 2nd XI against Yorkshire 2nd XI at Barnsley, when during the luncheon interval the ground simply swarmed with young boys who were either bowling a ball to each other or throwing a catch or fielding. It seemed as if it was inherited in the flesh of every Yorkshire boy to play cricket; every spare minute they seemed to be practising one way or other.

Keep practising your fielding; keep your heels together when stopping a straight ball; always use two hands if possible, and always try for a catch, however difficult. Also learn to pick up and throw in the same action. Aim to return the ball straight to the wicket-keeper's hands *at the top of the stumps*.

And just one word to young wicket-keepers. More batsmen are caught behind the wicket than are stumped. Don't be afraid to stand well back from the wicket when you cannot take the bowling at the top of the stumps. You cannot stump a man any more quickly from two yards back than from eight, but those extra yards may mean the difference between taking and missing catches.

In conclusion, play for your side, obey your captain in all things, and never question the umpire's decision.

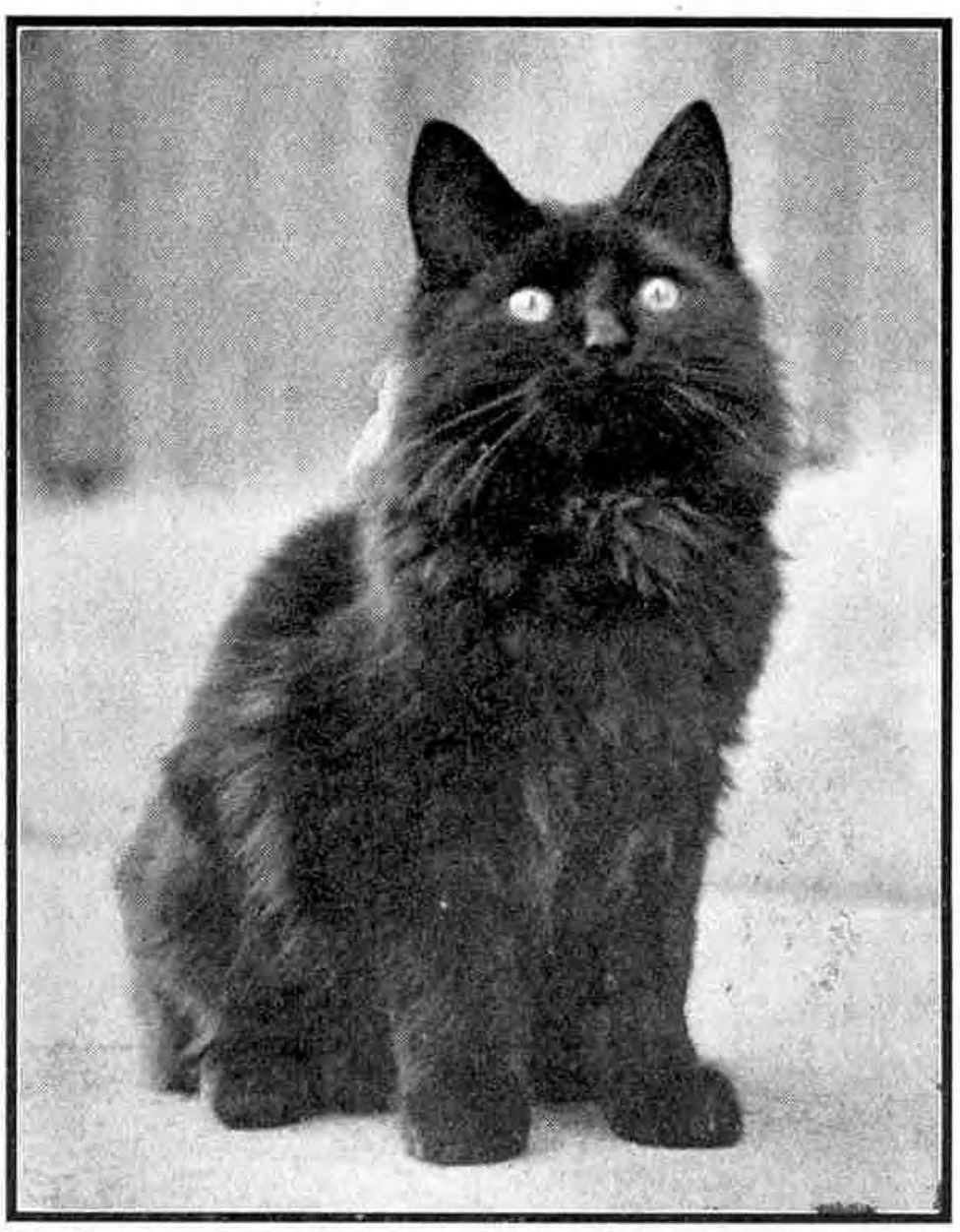


PRACTICAL HINTS ON SNAPSHOTTING

By J. J. Curtis

THE interest, pleasure and excitement provided by the hobby of photography are unlimited. It is true that there are disappointments lurking in the background, but most of these can be avoided without much difficulty.

One of the most important things to be learned in this connection is not to attempt impossibilities. For instance, there are large numbers of cheap cameras with a lens having a widest aperture of f11 and a highest shutter speed marked 1/100 of a second, but in most cases actually only 1/25 of a second. For all ordinary snapshots in a good light these cameras will do excellent work, often indistinguishable from photographs taken with quite expensive cameras. On the other hand they will not deal successfully with close-up views of objects moving at a high speed, such as trains, aeroplanes, motor vehicles of all kinds, and rapidly moving figures in games and athletics. Such subjects can be tackled, however, with reasonable prospects of success with even the cheapest camera, provided the photographer moves well back from his subject and is content to secure a very small image of it, which subsequently can be enlarged.



This charming picture "Tommy" secured First Prize in the A Section of the September 1937 Photo Contest for C. W. Beese, Hamilton, Ontario.

As a matter of fact it is often possible to secure the effect of speed when the object is really moving quite slowly. A photograph of a train just emerging from a station, making a great deal of fuss in the way of smoke and steam, but actually moving very slowly, often looks far more impressive than one of a train travelling at 70 m.p.h. and photographed sharply with an expensive camera. Here let me remind readers of the possibilities of photography at the outer ends of the platforms at a busy station, where the platforms are either actually in the open, or are sufficiently close to it for the light to be good. Armed with a platform ticket, one can spend a most enjoyable hour or two photographing engines waiting at the heads of their trains, or hauling trains slowly in or out. There are splendid opportunities here for chats with drivers and firemen, who are usually quite willing to be included in a cab view.

Distant landscapes form one of the most common causes of disappointing photographs. A view from the top of a hill extending over possibly five or ten miles looks very attractive, but the ordinary camera and lens cannot reproduce this effect. The eye, with its marvellous optical resources, automatically adjusts itself to the long view, but the camera lens is unable to do that. With special lenses of the tele-photo type it is of course possible to obtain very fine photographs of widespreading landscapes, but for the ordinary hand camera such views are best left alone. Sometimes it is possible to secure an interesting result by the use of foreground objects or figures. For instance, if you are standing on the edge of a cliff and looking across the harbour and out to sea, ask a friend to stand or sit two or three yards from the edge of the cliff, and move back with your camera until the view includes your friend well to one side of the picture, not in the centre. An equally good or better effect often can be secured by the use of a tree or a gate in a similar position. In either case the whole object is to break up the foreground.

Many photographic disappointments arise through attempting impossibilities in the matter of light. Well-lighted interiors of houses or any other buildings are apt to give the impression of being much lighter than they really are. Here is our old friend the eye at work again, adapting itself to the conditions in a way that is impossible for any lens. Again, supposing our way leads us through a wood. When we first enter the wood we

notice the lessened amount of light; but after we have walked along for a while the eye has accustomed itself to the change, and gives us the false impression that the light is really not bad after all. Before wasting films or plates on photographs in such conditions, consult your "Wellcome" calculator or your exposure meter, and you will be surprised to find how long an exposure is really necessary. In such circumstances of course it is almost always necessary to rest the camera on some firm support in order to give the required exposure.

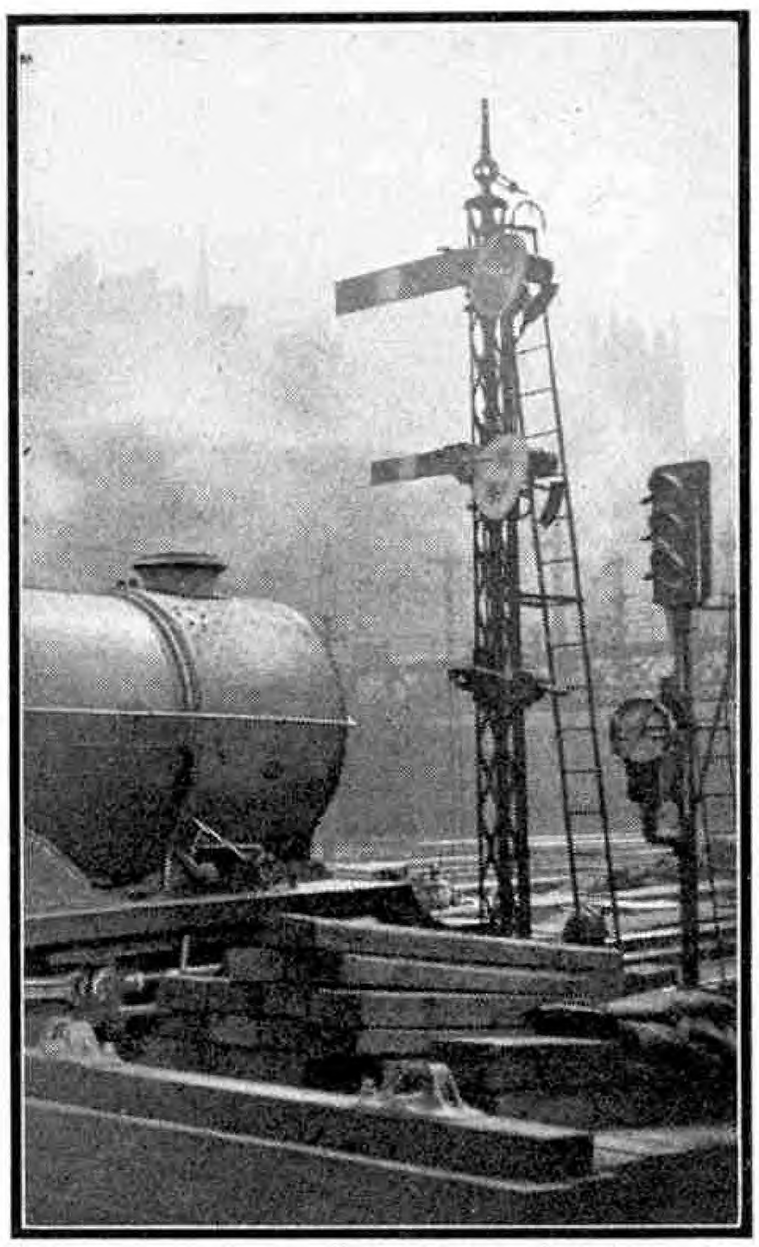


These are the two pictures, referred to on this page, showing the same path and clump of trees, taken from different viewpoints. The second picture was taken after moving only three yards to the left.

Among the entries for almost all our photographic competitions are some which, although otherwise of first-rate quality, are spoiled to a great extent because they were taken in the vertical instead of the horizontal position. With a very few exceptions, every camera makes use of a film or plate that is rectangular in shape; so that by turning over the camera either the upright position, or the horizontal or "landscape" position as it is often called, can be used. By far the largest proportion of general views require the horizontal position to look at their best; if they are taken in the upright position the whole effect is different, and in almost every case nothing like so good. Many years ago I used a reflex camera of a well-known English make that could only be used in the horizontal position, and I remember well how few were the occasions on which I felt handicapped by this restriction. Of course there are certain subjects, such as a full length portrait of a friend, or a snapshot of a tall building, that call for the upright position.

Mention of buildings reminds me to draw attention to the necessity of holding the camera level in taking such subjects. If your camera is tilted the building will be tilted also, and will look as though it is suffering from the effects of a recent earthquake! Unless your camera is fitted with the device known as a "rising front," by means of which the lens can be raised, photographs of such buildings as churches or cathedrals with high towers or spires can only be secured from a point at a considerable distance away. If you cannot get sufficiently far away to include the whole of the tower or spire without tilting up your camera, it is best to abandon the attempt, and instead photograph a section of the structure such as an elaborately carved doorway.

In taking snapshots of scenes that include moving objects there is not much chance as a rule to think about artistic arrangement, for the slightest delay may mean the loss of a striking or amusing picture. Matters are different in taking photographs of beauty spots in the country, and here a minute or so should be spent in making sure that we are standing at the place that will give the best pictorial arrangement. This does not mean learning a lot of complicated rules about form and design, but just the use of a sharp eye and a little commonsense. For instance, the upper illustration on this page shows two snapshots of the same path and clump of trees, taken from slightly different positions, and there is no doubt whatever that the picture on the right is the better. In the left-hand view the path cuts the picture in two and spoils it; in the other view the path leads out quietly in the corner and fades away in the distance. I am sure that every reader who thinks about these two views for a moment will see what I mean.



This unusual railway picture, taken at the Waverley Station by E. Read, Edinburgh, was a successful entry in the September 1936 Photo Contest.

Before leaving this subject I want to draw attention to the value of an unusual viewpoint. The prize-winning photographs in *"M.M."* competitions are quite often selected not because they are better photographs than their rivals, but because of their interest arising from something unusual. Sometimes even the most familiar and ordinary-looking scenes can be made really interesting by photographing them from a new position. A particular object that for some reason or other attracts general attention is snapped by hundreds of photographers from exactly the same point of view, and one gets sick of the sight of these photographs. Then comes along somebody with a sharp eye and a bit of imagination, takes his photograph from a different position that nobody else has thought of, and so turns out a picture that surprises his friends and arouses their envy! The lower photograph on this page illustrates this idea to some extent. It is just a little "different" from the usual railway snapshot.

Finally two bits of advice that you have probably heard many times, but which we are all apt to forget in the excitement of photographic hunting. The first is not to take out an exposed film and put in a new one while you are standing in blazing sunshine. The latest ultra-rapid films, and especially those that are panchromatic, are too sensitive for such treatment. Carry out your film changing in the shade.

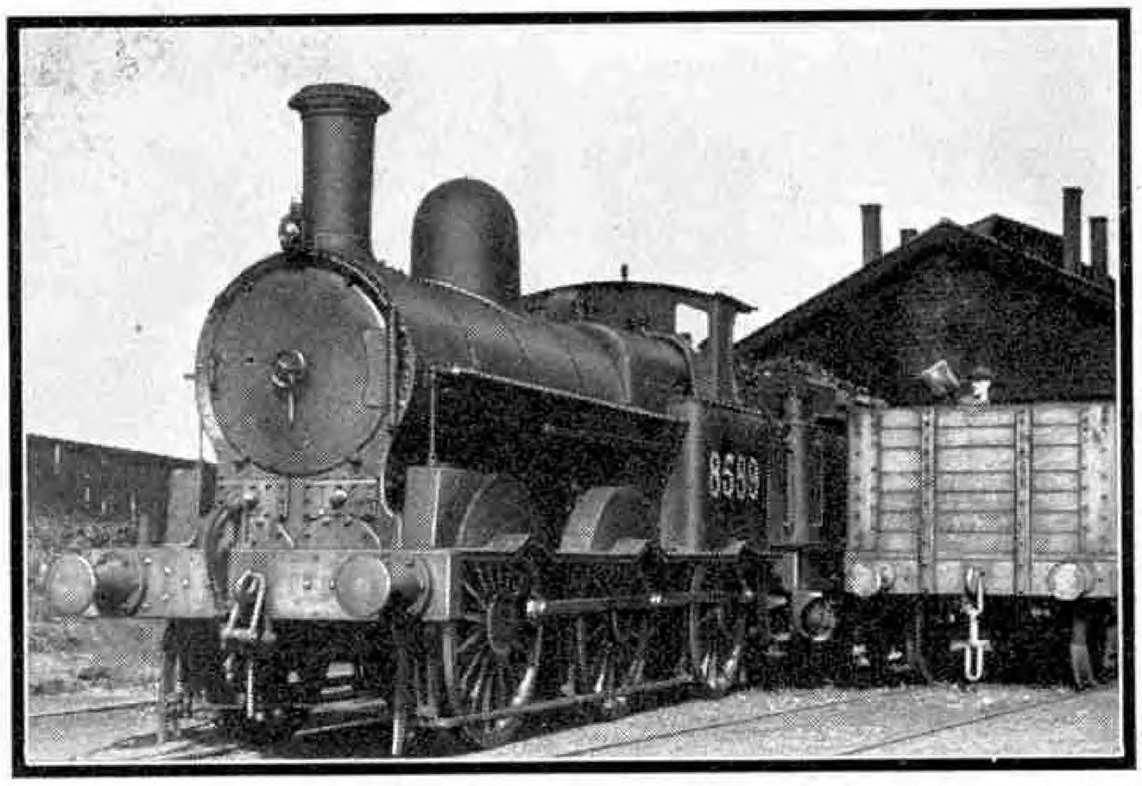
The second piece of advice is to wind on the film immediately after each exposure. If you make a regular habit of doing this you will save yourself a lot of annoyance and wasted film.

How Locomotive Tenders are Coaled

From Hand Filling to Automatic Loading

THE pile of coal in the tender or bunker of a steam locomotive is a familiar sight, but probably few travellers by train bother to think how it got there. For many years the coaling of engines involved a great deal of labour, as it does yet at certain locomotive sheds in remote districts. At important centres, however, it has now become almost an entirely mechanical operation controlled by a few switches and small handles.

The simplest possible conditions are found where the coal is shovelled out from wagons on one track on to the tenders of locomotives standing alongside. As the level of the coal in the wagons falls the toilsome nature of the work increases, but the coalmen who perform these duties are invariably brawny individuals who swing their big shovels with the ease born of long practice. The highest development of hand coaling operations involves a stage raised high enough to allow several tips or chutes mounted along one side of it to project outward over the tenders or bunkers of locomotives standing below. To serve the stage wagons have to be brought up an inclined road. Metal barrows or boxes running on wheels are filled by hand from the wagons and are pushed across the stage and their contents discharged at the tips. This type of stage was a general standard for many years.



The simplest method of coaling a locomotive. Shovelling coal out of a wagon standing alongside the tender. Photograph by Rev. E. Treacy, Liverpool.

To-day more efficient mechanical plant is necessary in order to reduce as far as possible the time taken in coaling. The first self-contained mechanical coaling plant was erected at Crewe about 1912, and Mr. C. J. Bowen Cooke, then Chief Mechanical Engineer of the former L.N.W.R., was largely concerned in its design. It was not until after the War that mechanical coaling plants became a necessity, however, and only since grouping have such plants been erected on an extensive scale.



The modern method of coaling. The fuel being fed to the tender from an overhead bunker. Photograph by courtesy of the L.M.S.

On the L.M.S. the reorganisation of motive power depots has been in progress since 1933 with the object of obtaining as much use in traffic as possible from the engines. Mechanical coaling plants have formed an essential part of the new equipment installed, and these fall broadly into two main types. Each includes an overhead storage bunker, or bunkers, of reinforced concrete, from which the coal can be supplied rapidly to a large number of engines in quick succession. The bunkers of these plants span the tracks on which the engines stand, so that the coal flows directly into the tenders. The larger type of plant has a total capacity of 300 tons in two 150-ton bunkers. The smaller type has a capacity of 150 tons in two 75-ton bunkers.

In these plants the filling of the bunkers is controlled by a single attendant. The coal wagons arrive at one side of the plant and are run in turn on to a wagon tippler by means of an electric capstan. The tippler elevates the wagons and turns them upside down, so that the coal, which is first well sprayed with water, is shot into a 20-ton steel container. When the container is full it is lifted above the tops of the bunkers and traversed inwards, to discharge its load automatically through bottom doors. The particular bunker to receive the load can be selected beforehand by the movement of a switch.

The smaller-capacity plants incorporate an electric wagon hoist that lifts the wagons one at a time on a table running on rails up the side of the bunker. At the top of the bunker the table is rotated until the wagon it carries is almost upside-down. The movement is then stopped automatically and the coal is shot out. From the bunker it is fed to the engines as required through discharge valves.

In each of these types of plants the loading of the tenders is done by the engine crews themselves, and is controlled from a small cabin at the base of the plant. Coal can be directed to any required part of the tender by setting a lever and operating the starting switch. The amount of coal taken and the number of the engine are automatically recorded at the same time.

A special type of plant has been developed for use at small depots where engines arrive in groups, and the first of these is installed at Stranraer. This has an overhead bunker fed by a chain and bucket elevator.

The Joy Snow Loader

Mobile Unit for Severe Winter Conditions

EVERY winter considerable inconvenience and loss of time is caused by heavy snowfalls that hinder or even stop traffic. The problem is perhaps not so serious in Great Britain, although even there scarcely a winter passes without the necessity for spending time and money in clearing the streets of our towns and cities. In Canada and parts of the United States, however, as well as in other countries where the winters are more severe, the difficulties caused by snow are much greater. It is therefore not surprising that machines have been introduced for clearing away snow and ice more quickly than it can be done by gangs of men armed with shovels and brushes.



The Joy Snow Loader, showing the gathering head with its mechanical arms. For the illustrations to this article we are indebted to the courtesy of Mavor and Coulson Ltd., Glasgow.

An interesting machine of this kind is the Joy Snow Loader, illustrations of which are reproduced on this page. This was introduced by the Joy Manufacturing Company, of Franklin, Pennsylvania, U.S.A., and is now supplied for all other countries by Mavor and Coulson Ltd., Glasgow.

The Joy Snow Loader picks up snow and ice, and passes it by means of a conveyor either to one side of the road, where it does not interfere unduly with traffic, or directly into lorries that carry it away. It is mounted on a standard motor chassis that can travel at any pace between a mere crawl and 2½ m.p.h. when it is at work, and is capable of a maximum speed of more than 25 m.p.h. when moving to or from the place at which it is to be employed. It works quickly and easily, clearing away from 10 cu. yd. to 20 cu. yd. of snow or ice a minute. The exact quantity depends on the character of the material dealt with.

The snow is collected by means of a gathering head 8 ft. 9 in. in width that projects from the front of the machine. This has a toothed edge that penetrates easily into the material, which is first scooped up and is then swept by mechanical arms on to a conveyor consisting of chain-driven articulated sections. The conveyor passes upward alongside the driver's cab and overhangs the rear of the vehicle by 11 ft., so that snow carried along by it and discharged from its end can be directed into a lorry travelling behind the machine.

The conveyor is supported by a steel boom, the rear end of which can be slewed sideways in each direction through any angle up to 45 deg. Thus the snow can be discharged on either side of the machine. The lower illustration on this page shows side discharging in progress. It also demonstrates a further use for the machine, which in this instance is loading lorries with snow that has been piled up temporarily out of the way.

Both the collector and the discharger can be adjusted to make work as convenient as possible. The toothed edge of the gathering head can be varied in position from 10 in. below ground level to 18 in. above it, so that it can be used for clearing snow and ice both from hollows and from ground higher than that on which the machine stands. Similarly the height of the delivery end of the conveyor can be varied from 8 ft. to 11 ft. 6 in. above the ground. All these movements, and the swivelling of the rear end of the conveyor, are effected by means of suitably placed hydraulic jacks controlled by means of valves in the cab.



The Joy Snow Loader at work removing a large heap of snow and ice, which it is loading into a lorry standing alongside.

Independent petrol motors are used for driving the vehicle and the loading mechanism. That providing power for loading has six cylinders, and develops 87 h.p. at the speed at which it is governed. The speed of the other engine also is governed. It develops 82 h.p. and drives the unit through a gear-box with four forward speeds and one reverse. Self-starters for both engines are controlled from the cab, and since the loading mechanism is operated from there, as already explained, one man takes full charge of the loader when it is at work. The cab itself is specially designed for the cold conditions in which the vehicle is employed, for it is weather-tight and is warmed by means of a hot water system. It is fitted with safety glass windows, full instrument panel and an upholstered seat for the driver.



L.M.S. (Wirral) Locomotives' New Duties

Mr. D. S. Barrie sends us the following interesting locomotive notes:

On the conversion of the Wirral section to electric working on March 13-14th, the majority of the steam locomotives previously employed on this section were dispersed elsewhere. Of the Fowler 2–6–2 tank engines 13 have been transferred as follows: No. 2 to Stoke; Nos. 3, 4 and 44 to Rugby; Nos. 5, 42, 49 and 50 to Llandudno Junction; and Nos. 12, 48, 51, 55 and 70 to Bangor. Other engines formerly stationed at Birkenhead North that have been transferred include four ex-L.N.W.R. 0–6–2 tanks, Nos. 7711, 7759 and 7780 and 7841, all of which have gone to Crewe. No. 7507 of the L.M.S. standard 0–6–0T class has been transferred to the service of the Chief Mechanical Engineer's Department at Birkenhead, after a short period on loan for similar duties at Crewe.

An interesting sequel to the transfer of 2–6–2 tanks from Birkenhead North to North Wales depots is that four Stanier 2–6–2 tanks with tapered boilers, Nos. 79, 82, 105 and 155, have been allocated temporarily to Devons Road, for experimental working on the North London section passenger services from Broad Street to the Great Northern line of the L.N.E.R. They are working primarily on the High Barnet service, where they naturally have a considerable advantage over the 0–6–0 Class 3 standard tank engines ordinarily employed, particularly on the bank at 1 in 60 or so from Finsbury Park to Park Junction (Highgate).

"British Legion"

Since being transferred from *"The Mancunian"* working No. 6170 *"British Legion"* has not figured prominently in the news, although a very good performance by this engine was timed by Mr. D. S. Barrie on a recent Sunday evening when it was allocated to work the 6.5 p.m. Liverpool express from Euston. The train weighed 475 tons gross, but in spite of the absence of a "banker" out of Euston No. 6170 made a good start and covered the 75 miles to passing Hillmorton Box, near Rugby, in 70 min., at an average speed of over 64 m.p.h. The best feature of this part of the run was the time of 13¾ min. over the 14.3 uphill miles from Watford to Tring. After passing Rugby, 82.6 miles, in 84 min., a final burst of 75 m.p.h. preceded a very cautious passage of Crewe, 158.1 miles in 166 mins., a gain of three min. on booked time.

Tall Signals at Dalston Junction

At Dalston Junction, on the North London section of the L.M.S., there still are some signals with the extremely tall posts typical of the days before the introduction of continuous brakes, when only the engine and guard's van were equipped with hand brakes. Then it was necessary that drivers should sight signals from as great a distance as possible, in order to be able to pull up if necessary with the limited braking power available. Signals were often built so as to be silhouetted against the sky and in city areas this meant their being of sufficient height to tower well above the surrounding buildings. The signals at Dalston Junction are about 80 ft. high, and the height can be judged from the size of the train and the bridge in the accompanying illustration. There are not many of these tall signals to-day, and in most modern colour-light signal installations posts of comparatively moderate height are in general use.

W. S. GARTH.



An L.M.S. standard 0-6-0 tank locomotive on a local train at Dalston Junction. The unusually tall signals are an outstanding landmark at this point. Photograph by W. S. Garth, Preston.

Faster L.M.S. and L.N.E.R. Schedules

Among the alterations to be made by the L.M.S. on 2nd May is the acceleration of *"The Royal Scot"* to a timing of 7 hr. between Euston and Glasgow, a saving of 45 min. on the down journey. On the southbound run 25 min. are saved. On the northbound run the Rugby and Crewe stops will be omitted, and Carlisle will be reached in 5 hr. The train will be divided at Symington, and the Glasgow portion is to reach its destination at 5 o'clock and the Edinburgh portion 5 min. later. The Glasgow and Edinburgh sections of the up train will run independently to Euston. The train from Glasgow will halt at Carlisle No. 12 Signal Box to change enginemen, the Edinburgh portion stopping at Symington to attach coaches from Aberdeen and Perth. The maximum loading of these expresses will be 420 tons when a 4–6–2 engine is in charge, and 330 tons if a "Royal Scot" is used.

The present 2.15 p.m. express from Liverpool to Euston is to start at 2.10 and complete the journey in 3 hr. 20 min. The 5.25 p.m. from Liverpool, popularly known as the *"Liverpool Flyer,"* will no longer stop at Willesden, but will run from Crewe to Euston in 148 min. at an average speed of 64.1 m.p.h. Euston is reached in 3¼ hr. from Liverpool, the fastest schedule ever in force between these points. In view of this it will be interesting to see whether an official title will be bestowed upon this popular train.

The L.N.E.R. *"Flying Scotsman"* will return to its summer schedule of 7 hr., but a stop will be made at Newcastle in each direction.

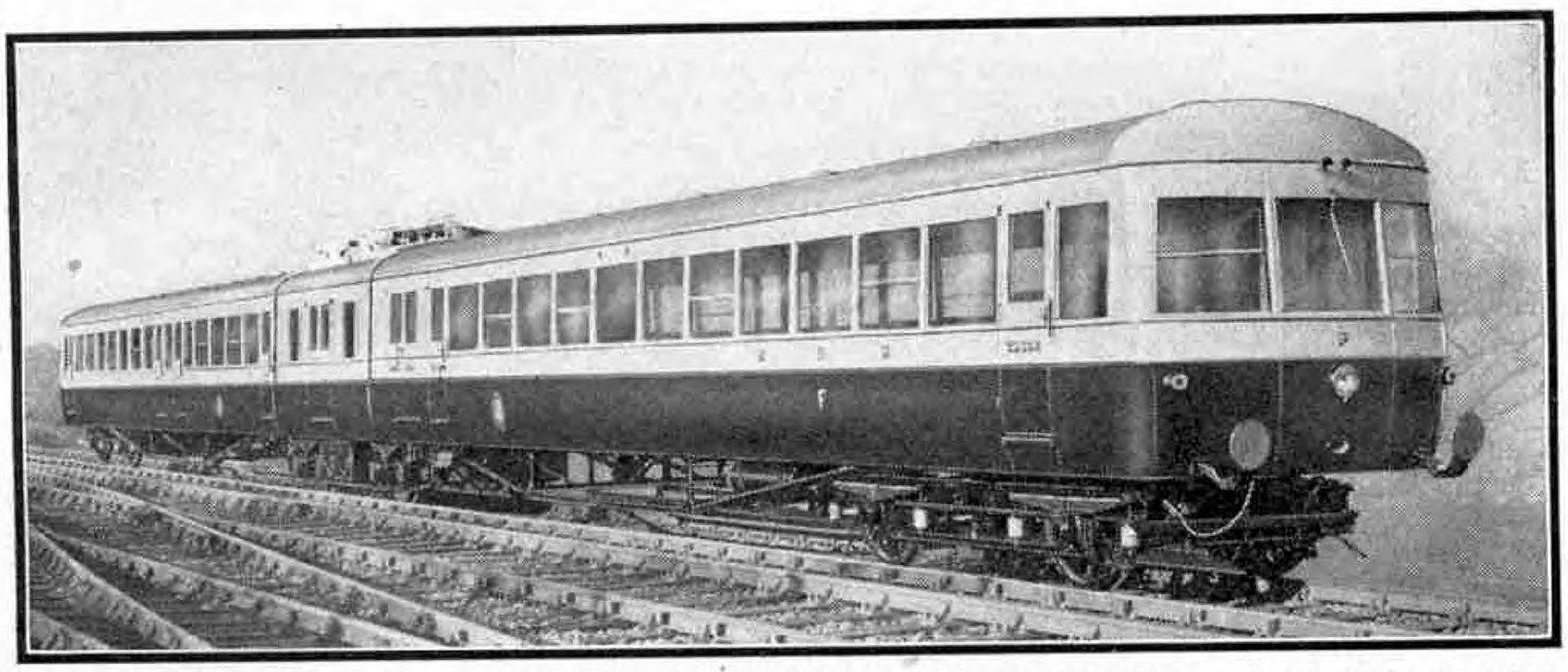
An improvement of the up service from Aberdeen in connection with *"The Flying Scotsman"* will be effected by starting the present 6.10 a.m. express at 6.40 a.m., arriving at Edinburgh at 9.49 a.m., and so giving a service from Aberdeen to King's Cross in 10 hr. 20 min. On the down journey, however, Aberdeen passengers travelling by *"The Flying Scotsman"* will be forced to wait 40 min. at Edinburgh, as the Aberdeen connection will be held back until 5.40 p.m. so as to connect with the 10.5 a.m. from King's Cross.

C.P.R. Bell for L.N.E.R. Locomotive

The C.P.R. have presented to the L.N.E.R. a standard Canadian locomotive bell for fitting to the streamlined "A4" locomotive No. 4489 *"Dominion of Canada,"* which already has a whistle of the Canadian type. The bell has been mounted on the front of No. 4489.

New Railcars for G.N.R.(I)

The G.N.R.(I) have for some years had in service several Diesel-engined railcars of various types for light suburban and branch line services, the first experimental cars having been introduced in 1932. Now a further two articulated railcar sets have recently been completed at the Dundalk Works of the company to the requirements of Mr. G. B. Howden, Chief Engineer. These are intended for use on the Dublin-Howth suburban services. Each consists of two passenger cars and a central power bogie. The advantages of this make-up are that all noise, vibration and fumes from the engines are confined to the power bogie and maximum adhesion of the driving wheels is secured.



One of two new articulated Diesel railcars introduced by the G.N.R.(I) and described on this page. These cars have a patent central power bogie and are for use between Dublin and Howth. Photograph by courtesy of the G.N.R. (I).

Each of the power bogie axles is a driving axle and is furnished with a separate power unit and transmission. The engine accelerators are mechanically controlled from the driving compartments, one of which is situated at each extreme end of the passenger cars. On a panel in front of the driver are the engine revolution indicators, vacuum gauges, oil pressure gauges and indicators showing the position of the hinged entrance steps. The engine accelerator lever is mounted on the side of each panel, and a "dead man's handle" safety device is attached. This brings the engines to idling speed and applies the vacuum brakes to the 12 wheels of the vehicle in the event of any mishap occurring to the driver. The gear selector and change speed levers are mounted on the panel.

Sufficient fuel for a journey of approximately 300 miles is contained in two fuel tanks mounted transversely over the engines. Gravity feed is thus obtained and failure of the fuel supply is impossible, so long as there is fuel in the tanks.

The speeds provided for by the five-speed gear-box range from 11.9 m.p.h. in first gear to a fifth gear speed of 48 m.p.h.

The bodies of the passenger cars are of timber construction with steel outer panels, and are finished in the shades of blue and cream that are standard for railcars on the G.N.R. The roof is of wood, covered with canvas painted grey.

L.M.S. Locomotive News

Class 3 2–6–2s Nos. 199-206 and No. 175 are in traffic. Further "Patriots" Nos. 5503, 5516, 5523 and 5546 have been named *"The Leicestershire Regiment," "The Bedfordshire and Hertfordshire Regiment," "Bangor"* and *"Fleetwood"* respectively.

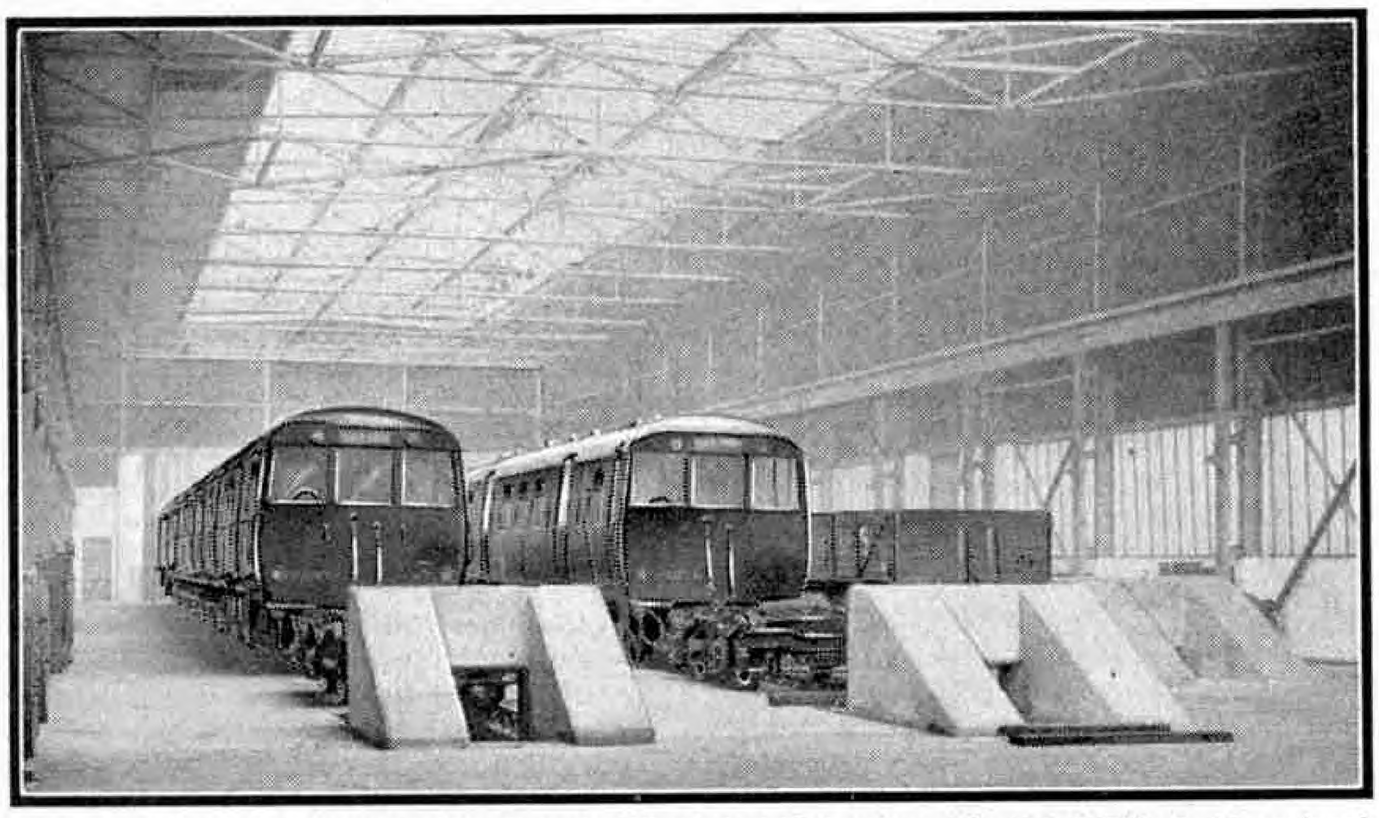
The "Locomotive Stock Book" Appendix

The 1938 Appendix to the "Locomotive Stock Book" for 1937, published by the Railway Correspondence and Travel Society, and mentioned in these pages last month, is now available, price 1/6 post free. The Stock Book can still be obtained at 2/6 per copy, and this Appendix brings it right up to date, the two together providing a complete list of main line and principal light railway locomotives of Great Britain and Ireland in service at the end of 1937. The two books can be obtained for 3/9, post free, from Mr. R. T. Pollock, 102, Disraeli Road, Putney, S.W.15.

New Zealand "G" Class Locomotives

In 1929, three "Garratt" locomotives were delivered to the New Zealand Government Railways but unfortunately they proved unsuitable for conditions in that country. It was decided therefore that engines of half their power would be sufficient and, as the "Garratt" type lends itself to modification, the six new "G" class 4–6–2s are the outcome.

The two driving units from each of the three "Garratts" with new boilers have been used in the construction of the six "G" class engines. The piston valves of the two outside cylinders are moved directly by ordinary Walschaerts gear, while the valve of the centre cylinder is driven by a system of levers worked off the tail rods attached to the outside valves.



The new repair shed at Birkenhead North on the Wirral electrified system of the L.M.S. This shed is equipped for the maintenance of the new electric trains. Photograph by courtesy of the L.M.S.

Notes from America

A train load of coal briquettes weighing about 4,000 tons was conveyed recently over the Norfolk and Western system in the United States. It is interesting to note that this colossal load was in charge of one engine!

The Chicago and North Western and Union Pacific Railroads have doubled their present joint streamline train service between Chicago and Los Angeles, and streamliners now operate every third day each way between the two cities. The high speed *"City of Los Angeles"* service will be provided alternately by a 17-car train and one of 11 cars.

A 39¾-hr. service from Chicago to San Francisco is afforded by the 17-car streamliner, the *"City of San Francisco,"* of the same railways, and also by the all-Pullman, streamline steam-powered *"Forty-Niner,"* via the Chicago and North Western, Union Pacific and Southern Pacific routes.

The Atchison, Topeka and Santa Fé Railroad have put a great deal of new equipment in service, and both the *"Super Chief"* and a new Diesel train named the *"El Capitan"* are now running twice weekly in each direction between Los Angeles and Chicago. The new train is similar in appearance to the *"Super Chief,"* but consists of only one Diesel unit and five stainless steel cars. It is unique in that it offers day coach accommodation only.

The Santa Fé have ordered 27 new steam locomotives and the first six, which are 4–6–4s, have been delivered. These are outstanding engines as may be judged from their specifications, which include 7 ft. driving wheels, a boiler pressure of 300 lb. per sq. in., cylinders of 23½ in. dia. by 29½ in. stroke, and a tractive force of 49,300 lb.

"Facts About British Railways"

The 1938 edition of the booklet issued on behalf of the main line British Railways under the title of "Facts About British Railways" is now available upon application to the British Railways' Press Office, St. Ermin's, Caxton Street, Westminster, S.W.1.

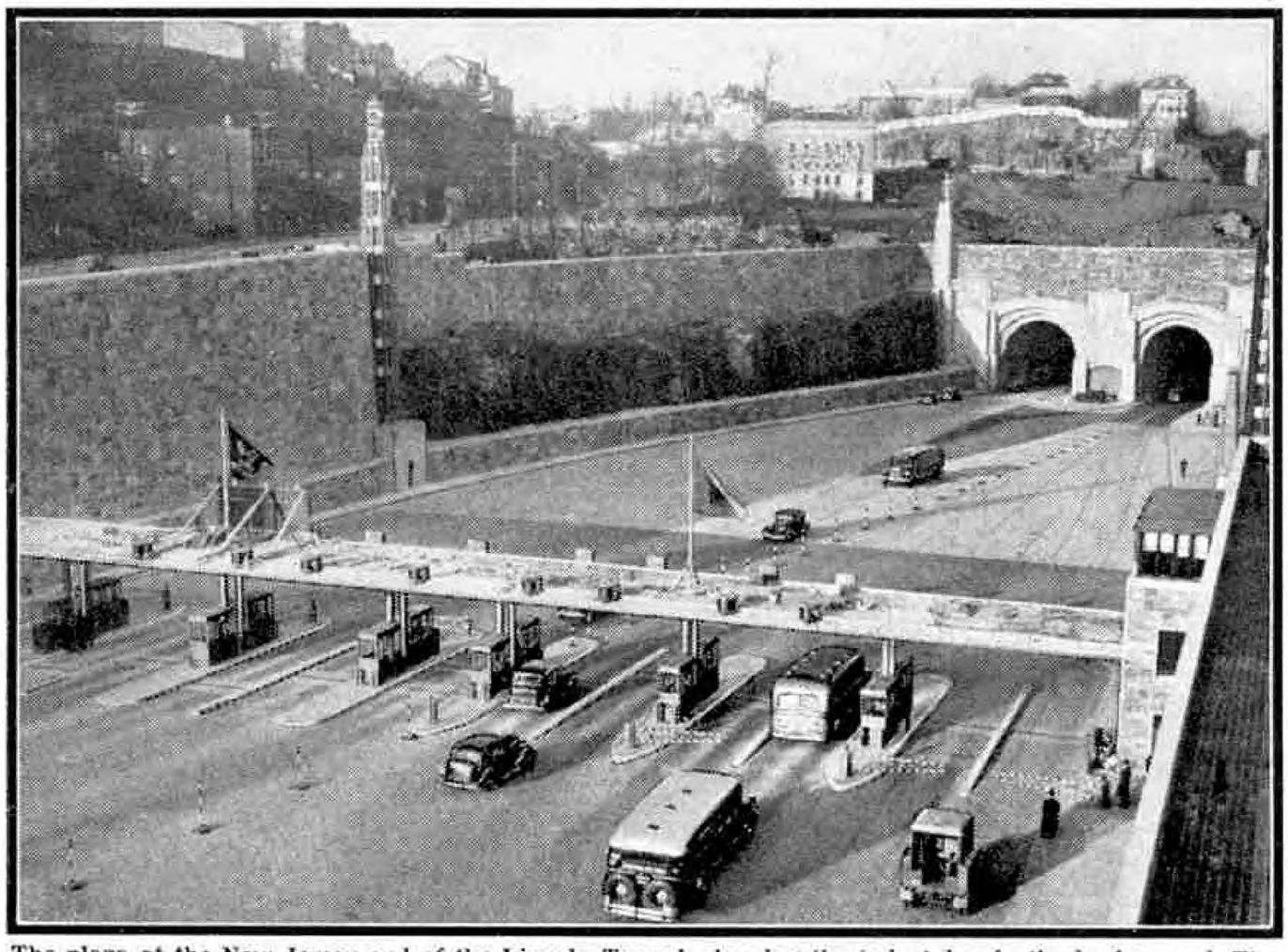
The figures contained in the booklet are for the year 1937 and the information has been summarised to illustrate the various directions in which the railways have been active during the year, and the ways in which they cater for the needs of the trader and the traveller. Facts, figures and statistics covering many features of railway activity are given. A useful map also is included.

Burrowing Under the Hudson River

The Twin Tubes of the Lincoln Tunnel

THE waterways of New York have been the scene of many famous engineering exploits in the past. On the west of the city the Hudson River separates Manhattan, in which is the crowded business centre, from Jersey City and other rapidly growing districts in the State of New Jersey on the mainland, and on the east side of Manhattan is the East River, with Brooklyn and Long Island on the farther side of it. Over both these waterways great bridges have been erected, among them such immense structures as the George Washington Bridge across the Hudson River, which until recently was the largest suspension bridge in the world, and a series of huge and important bridges across the East River.

New York indeed has been described as a city of bridges, and soon it will have earned the additional title of a city of tunnels because of the many structures of this kind that pass under its rivers. Most of these are railway tunnels. A few years ago the twin tubes of the Holland Tunnel were bored under the Hudson River to allow the passage of motor vehicles, however, and now a further tunnel, also with twin tubes, is being driven under the same river three miles higher up. This is the Lincoln Tunnel. One of its tubes was opened for traffic on 22nd December of last year, and the other is expected to be completed in 1940.



The plaza at the New Jersey end of the Lincoln Tunnel, showing the twin tubes in the background. The illustrations to this article are reproduced by courtesy of the Port of New York Authority.

The immense growth of traffic across the river has made it necessary to provide this additional means of passing between Manhattan and New Jersey, on the west bank of the Hudson River. The George Washington Bridge, the Holland Tunnel and the many ferries crossing the river are finding increasing difficulty in coping with the traffic, and as many as 75,000,000 vehicles are expected to cross annually by 1948, or five times as many as in 1915. The George Washington Bridge will be able to accommodate 26,000,000 of these, the ferries will give passage to 13,000,000, and the Holland and Lincoln Tunnels will take 18,000,000 each.

An interesting feature of the new tunnel is that it forms part of a great scheme for linking up New Jersey and Manhattan with Long Island, on the opposite side of the East River. A new underwater tunnel will be bored under the East River in direct line with the Lincoln Tunnel, and the two will be connected by a subterranean roadway passing under Manhattan. Thus in time it will be possible for motorists to travel from Long Island to the mainland and vice versa without having to pass through the streets of Manhattan.

The completed tube of the Lincoln Tunnel is the south one, and from its portal on the New York side to that in Jersey City it measures 8,215 ft., or nearly $1\frac{3}{4}$ miles, the length actually under the River being 4,600 ft. The tube is circular in shape, with an outer diameter of 31 ft., and it penetrates the bed of the river to a maximum depth of 75 ft. below high water level, the shallowest covering of mud and silt above its top being 20 ft. The roadway is 21 ft. 6 in. wide, giving space for two lines of traffic, and from its position in the lower part of the tube to the ceiling of the traffic space there is headroom of approximately 13 ft. 7 in. throughout. The spaces below the roadway and above the ceiling are used for ventilation purposes.

The ends of the tunnel, both on the New York and on the Jersey City sides, had to be carried through rock, and there the boring was carried out by similar methods to those used in driving railway tunnels through mountains, the rock being drilled and blasted. Near the entrances, where the tunnel rises almost to the surface, the "cut and cover" method was adopted, that is cuttings were excavated and afterwards roofed in.

Under the river an entirely different plan was followed, for the engineer cannot use drills and dynamite for driving a way through mud or silt. His tools for work of this kind are compressed air and a gigantic tube with a cutting edge that is pushed forward by means of jacks. This tube is called a shield. In its original form it was invented more than 100 years ago by Sir Marc Brunel, who used it for driving the tunnel beneath the River Thames between Rotherhithe and Wapping, and various improvements have since been made. The two shields employed in boring the Lincoln tunnel consisted of huge circular cutters, 18 ft. 10 in. in length with a diameter of 31 ft. Their cutting edges were of cast steel and each was driven forward when necessary by means of 28 powerful hydraulic jacks arranged at intervals round its edge. Each shield weighed 210 tons, and its hydraulic equipment accounted for an additional 100 tons.

The danger against which the engineers in charge of such operations must guard is the inrush of mud and water into the works. For this purpose they build a steel and concrete bulkhead behind the shield, and fill the intervening space with air at such a pressure that the water and mud are kept out. In the case of the Lincoln Tunnel the pressure used was 16 lb. per sq. in. The workmen entered and left the compressed air section through a lock in the bulkhead in which the pressure was altered gradually. Tunnel workers who pass too quickly from a region of high pressure to one where the pressure is that of the atmosphere are liable to the onset of the disease known as "bends," to which divers also are subject if they ascend from great depths to the surface too quickly. The cause of this disease is the release of dissolved nitrogen in the blood when the pressure is lowered. If this process is too rapid the nitrogen forms bubbles, which interfere with the normal working of the blood and may even cause the tissues to be seriously torn.

All previous tunnelling speed records were broken when these shields got to work. The first was erected at the bottom of a construction shaft dug on the New Jersey side of the river at the site of the ventilation buildings. Work started in September 1934, and after an initial short stretch of rock had been dealt with the shield moved into the soft silt of the Hudson bed. The speed of working steadily increased, and in only seven months the shield had been pushed forward a distance of 5,060 ft. to the New York shore. The greatest advance in one month when the Holland Tunnel was built was 555 ft., but as much as 1,040 ft. was penetrated in the same time in boring the south tube of the Lincoln Tunnel, the number of actual working days being 25. When the organisation was complete, a steady daily progress of 40 ft. was made. On one particular day this was increased to 45 ft. while the shield itself was moved forward 47 ft. 6 in. whereas the highest daily advance in constructing the Holland Tunnel was 25 ft.

The work of the New Jersey shield had several interesting features. It was driven under the river "blind," that is the face of the shield was closed by a bulkhead, and as it was pushed forward most of the silt encountered was simply thrust aside. This had the effect of lifting the bed of the river along the line of the tunnel, in

spite of the intervening thickness of mud. A small proportion of the displaced silt was allowed to enter the tunnel through two small openings, 2 ft. 4 in. square, provided with hydraulically-operated sliding gates. This was carried along the tube by a conveyor and dumped on the floor. There it was left for a time as ballast to prevent the tunnel from floating upward through the silt, and afterwards was removed largely by hand shovelling and high pressure water jets.

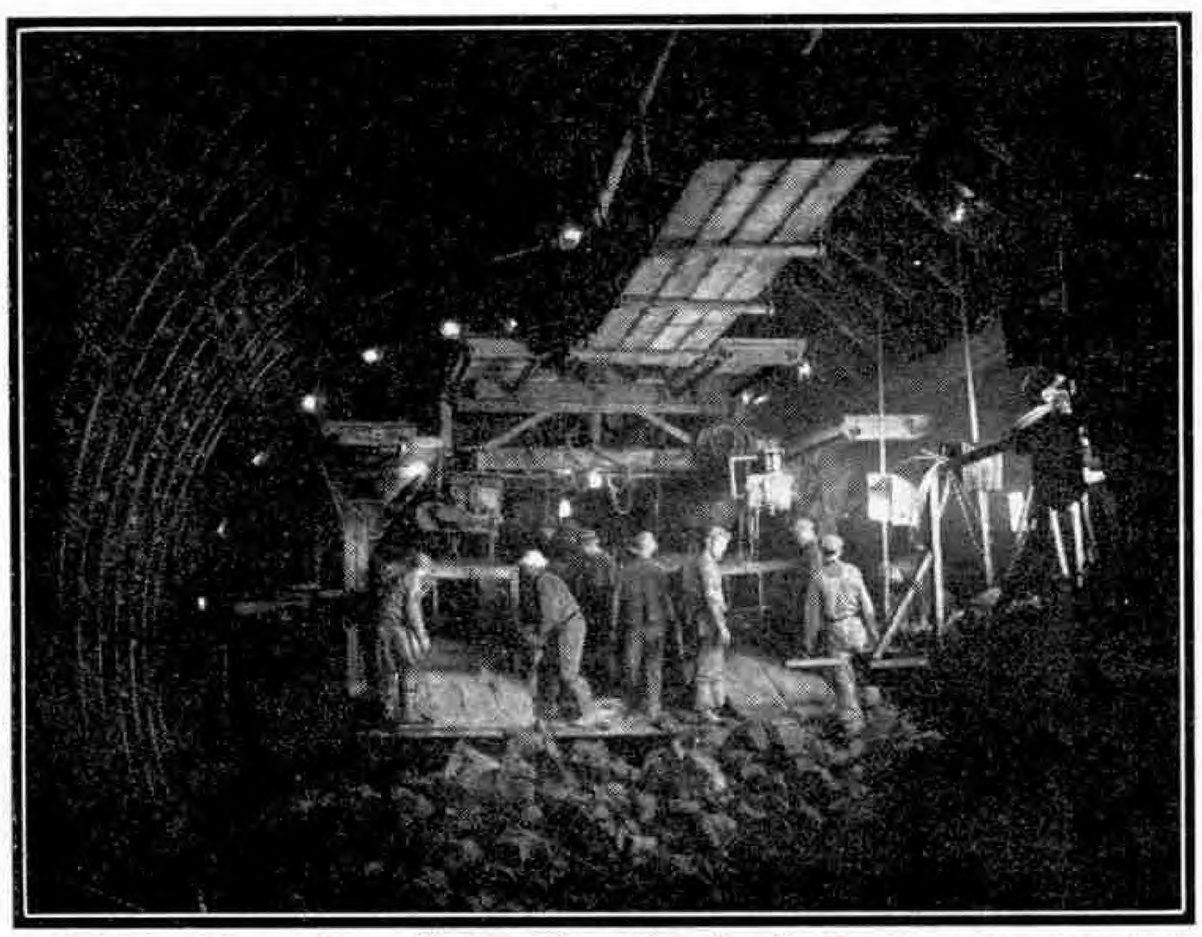
Slower progress was made with the second shield, which was set up in a construction shaft on the New York side of the river. The reason for this was that this section of the tunnel had to be driven partly through rock, and the proportions of rock and soft ground at the heading changed frequently. The rock had to be loosened by drilling and blasting, and removed by hand labour, and in consequence only 900 ft. were covered on this section while the shield that started from the New Jersey side was advanced 5,060 ft. The two shields met in a caisson sunk to a depth of 100 ft. which formed the base of the New York riverside ventilation building.



The ultimate arrangement of the New Jersey approach of the Lincoln Tunnel, showing the loop viaduct and the depressed road now being constructed. One of the ventilation buildings also can be seen.

The tunnel was lined with rings of cast iron or steel, the latter being used where the stresses were greatest. Each ring is 30 in. in length, and consists of four sections, its total weight being nearly 20 tons. Altogether 4,591 rings will be required for the two tubes of the Lincoln Tunnel. Each shield was pushed forward to a sufficient distance to allow a ring to be erected behind it, and another move ahead followed the completion of this work. Thus the progress of the shield depended on the rate at which the cast iron lining rings could be set and bolted together, and this process was speeded up by the use of several mechanical devices. The most important of these was a hydraulic bolt tightener. Belt conveyors were largely used for carrying the excavated spoil beyond the dam or bulkhead that followed the shield, and a new type of erector-arm gripper was introduced to speed up the setting of the segments of the rings. Another interesting device employed was a travelling "jumbo" or scaffold, which carried nine platforms arranged in working positions round the circumference of the tunnel. This travelled with the shield, and the platforms could be moved independently backward or forward by pneumatic jacks.

The lining segments were transported to the heading on a narrow gauge track laid down on a platform at one side of the tube. Each train carried enough segments for a complete ring. When it reached the working face, the segments were unloaded by means of a hoist and placed at the bottom of the shield, where they could easily be picked up by the mechanical erector and lifted into position ready for bolting. Steel sections were used in the land tunnels, and these were twice as wide as the cast iron sections of the river tunnel.



Behind the shield tunnelling under the Hudson River from the New Jersey side. This shield was pushed forward at the record speed of 40 ft. a day.

The tunnel was lined with concrete to a minimum thickness of 1 ft. 6 in., measured from the outside of the structure. Steel beams support the roadway, which is made of concrete and is covered with a paving of vitrified bricks. An experimental section of paving of this kind was first laid down on one of the approaches to the Holland Tunnel. The upper part of the tunnel is shut off by a steel and concrete ceiling lined with stippled glass tiling which is being used for this purpose for the first time.

The ducts or channels for electric wiring are in the concrete of the side walls, and the lighting, fire protection methods and equipment generally follow the lines adopted in previous tunnels of this kind. Ventilation of course was all-important, since the tunnel is designed for motor traffic, and the poisonous fumes of motor car engines have to be removed quickly. Each tube is divided into several sections, through which a steady circulation of fresh air is maintained by means of huge fans in three ventilation buildings, one on each bank of the river and the third near the New York entrance. In these buildings fresh air is drawn in through louvres in the side walls by means of intake fans placed on different floor levels, and is delivered to the part of the tunnel below the roadway, which forms a fresh air duct. From there it passes through special openings into the space used for traffic and thence into the upper part of the tunnel, which is an exhaust air duct. Its passage through the traffic space is speeded up by the use of exhaust fans, which drive it into the atmosphere through vertical stacks passing upward through the roofs of the ventilation buildings, well clear of the fresh air intakes.

The ventilation towers are built of steel and concrete and are faced with brick. They contain the machinery for driving the huge fans required for ventilating the tunnel. When both tubes are in use 56 fans, with a combined capacity of nearly 9,000,000 cu. ft. of air a minute, will be required. Of these 26 will be blowers and the remaining 30 will be required for withdrawing vitiated air. The capacities of the individual fans range from 105,000 to 280,000 cu. ft. per min.

Special care has been taken to avoid congestion near the entrances to the tunnel. The entrances to the two tubes on the New York side will be widely separated and each will be connected with main thoroughfares by means of special approach roads. At the New Jersey end a more elaborate system of roadways has been worked out. Both tubes are designed to swing round in a quarter of a circle and to emerge in a single spacious plaza that is connected directly with two principal roads along the line of the Hudson River. One of these roads has been redesigned along the length of 3,000 ft. in order to make way for the tunnel approach.

In addition a wonderful new highway giving direct access to the Tunnel from the west has been built right across the built-up area. This will lead directly to and from a new State Highway to be built in New Jersey. It lies in a wide cutting passing under streets that run north and south, and on reaching the site of the Tunnel it swings round in a loop and over a viaduct, turning back upon itself to enter the plaza on the south side. This great new road scheme will involve the replanning of several miles of existing roads.

It is estimated that the south tube will be used every year by approximately six million vehicles, so that it will be of immediate value in relieving the pressure upon the existing trans-river services. It will carry both eastbound and westbound traffic until the completion of the northern tube early in 1940, when each tube will be used as a double one-way road.

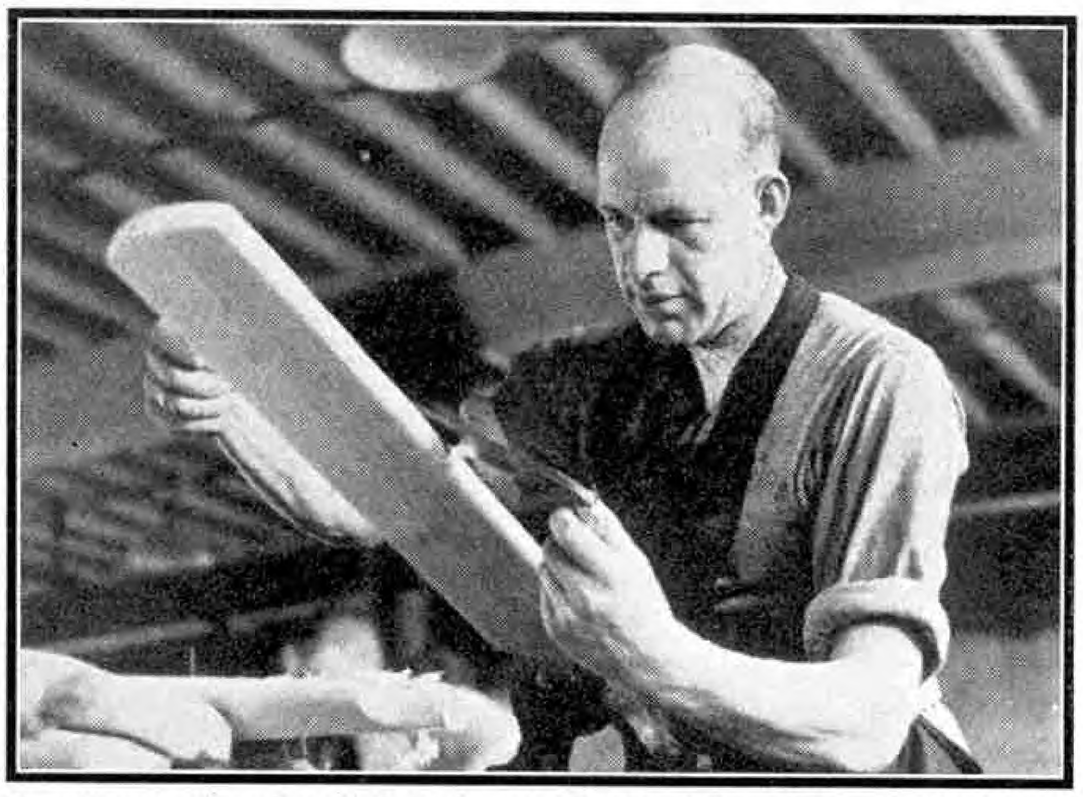
HOW THINGS ARE MADE:

The World's Largest Cricket Bat Works

By The Editor

THIS is the time of the year when our thoughts turn once more to cricket, and we are either getting out last year's bats and making sure that they are in good condition, or are looking for new ones, and generally getting everything ready for what we hope will be a splendid season. My own interest led me to wish to know more of the making of bats and other cricket equipment, and for this purpose I paid a special visit to the works of William Sykes Ltd., the largest makers of bats in the world.

As seems only natural in view of Yorkshire's wonderful record in the game, these works are in that county, at Horbury, near Wakefield, and there I talked with craftsmen who shape bats for our greatest cricketers, and learned some of the secrets of the art of bat making. I was shown magnificent examples of finished bats, and greatly envied their ultimate possessors as I tested them. I was even allowed to play imaginary strokes with wonderful bats that have been made for the members of the Australian team touring England during the present season, and as I swung each forward in turn I admired its perfect balance, and at the same time wondered whether I was holding a bat with which Don Bradman or some other of our visitors would run up a century, perhaps in a Test match.

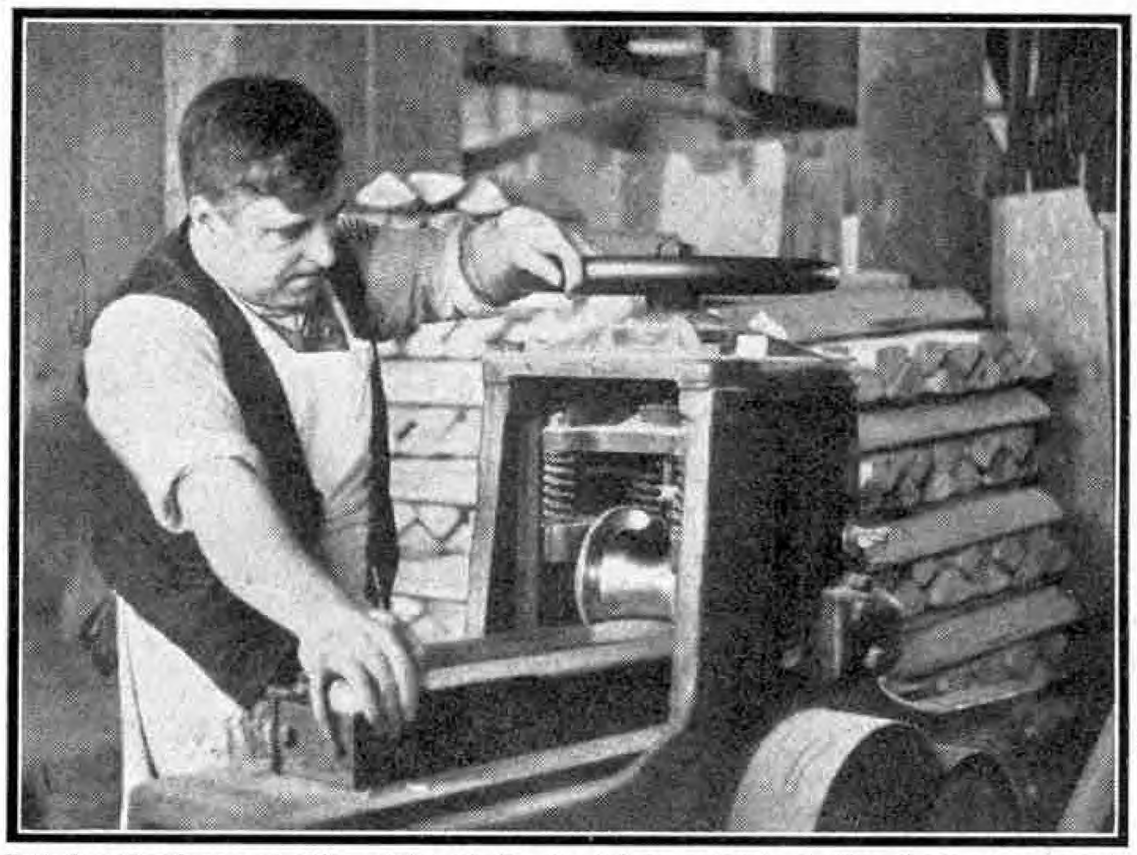


A craftsman using a draw knife to give a bat its correct shape. We are indebted to the courtesy of "Weekly Illustrated" for our illustrations of work in progress in the factory of Wm. Sykes Ltd., Horbury, Wakefield.

The life story of a bat begins in Essex or Suffolk, where the willows are grown that provide the wood of which the blade is made. There are many varieties of willow, but only one that yields wood suitable for this purpose. This has a straight grain, and cricketers often insist on the bats they buy having perfectly white blades throughout. This is not absolutely essential, however, for blades with faint red markings, known to bat makers as "butterfly stain," are at least equally good and reliable, the colour of the blade being immaterial except from the point of view of appearance.

When a willow is cut down the trunk is sawn into lengths and is then split into "clefts," pieces rather longer than the blade of a bat and of triangular cross section, with the grain running from end to end. It is these clefts that form the bat maker's raw material. They are sent to the works, where their faces are trimmed, and then follows a very important process in ensuring that each blade will give good service over a long period. This is the seasoning, which requires from 18 months to two years. During this period they are piled in stacks of lattice formation, so that the air can pass freely round every one of them. The stacks are built up in immense sheds, containing many thousands of clefts, and some of those I saw will not appear as bats ready for the player until the season after next.

When the clefts are thoroughly seasoned they are moved into the works to begin their transformation into bats. At every stage of this process they are taken in hand by craftsmen, skilled with their tools and knowing by long experience exactly how to shape the blade to give the proper balance, with the weight in the right place. The chief tool used in these operations is the draw knife, a sharp blade fitted with a handle at each end that is pulled towards the wielder; and a few deft strokes with this tool reduce the cleft to a shape that would easily be recognised by anyone as that of a bat.

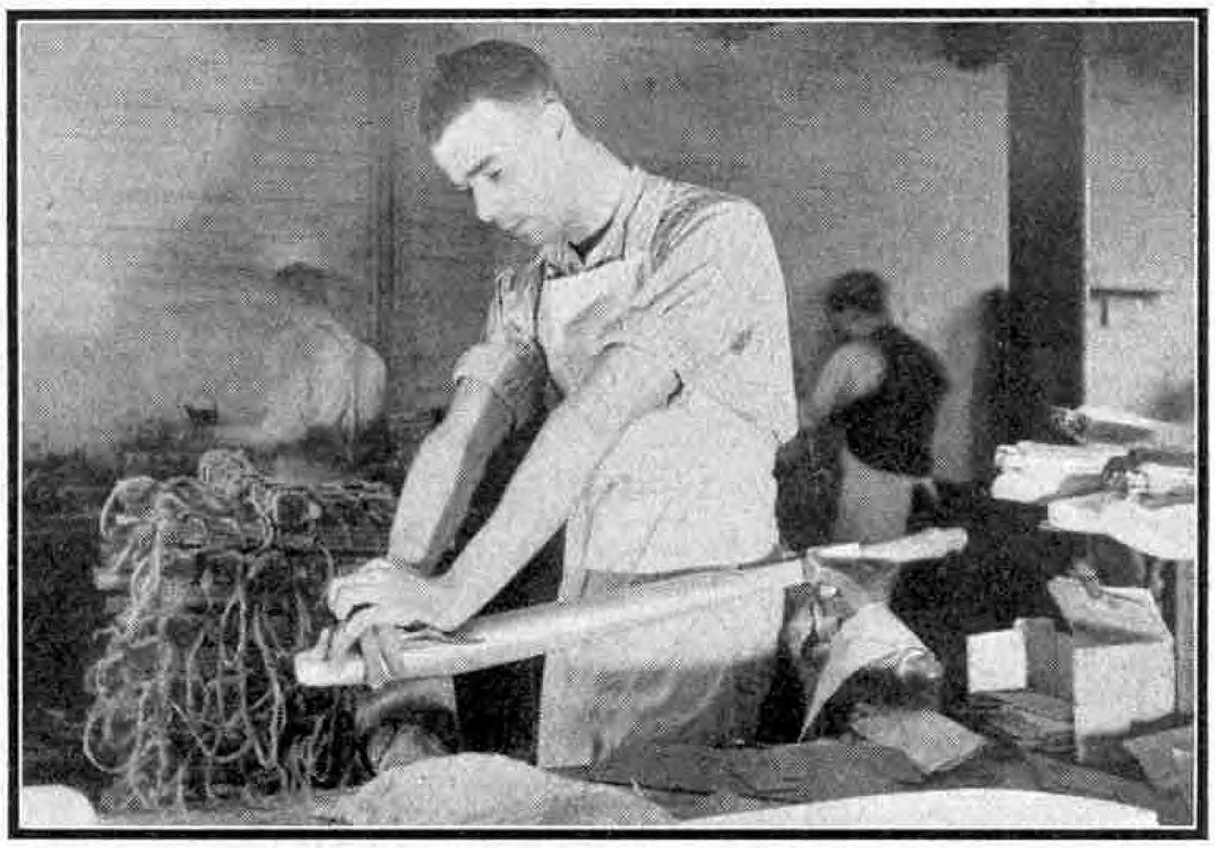


Pressing the face and sides of the blade of a bat in order to harden them. A pressure of two tons is applied to the blade as it passes through the press.

The face and edge of a bat must be hardened, and they are therefore subjected to heavy pressure. For this purpose each blade at this stage is passed through a power press, in which a pressure of two tons is applied evenly throughout as it is worked forward and backward twice. Then the blade is cut or spliced to allow the handle to be fitted. This splice is cut out by a special method, and with a mathematical precision that absolutely ensures a perfect joint and fit when the handle is inserted by the craftsman.

In the meantime the handles for the blades are being made. For this part of the bat canes imported from Sarawak, in Borneo, are used. These are cut into the required lengths, and the carefully selected pieces are then

passed into the factory for what is one of the most interesting of the processes carried out there. It is the cane handle that gives a bat its resiliency, and this is obtained by building it up from 16 canes. The process is carried out in two stages, in the first of which four canes have their sides planed, squared and glued before being placed side by side and tightly bound together by a cord until the glue is set. This takes about two days, and the cords round the slips are then removed, and four slips are glued together in a similar manner, except that this time thin strips of rubber are included. A modern development of bat handle making is to insert rods, of about $\frac{1}{8}$ in. diameter, of special steel that helps to give the handle the slight "whip" or springy feel that cricketers like their bats to have.



Rubbing the surface of a blade with sandpaper. The surface is afterwards polished by friction rubbing in a similar manner.

The handle is now in the form of a square rod, and this is given the correct shape by turning it in a lathe. Only the part that will form the actual handle is turned, the end from which the splice is to be formed being left square, and afterwards given the shape of a wedge by two quick cuts with a circular saw.

The two parts of the bat are then ready for fitting together. This is a task for the skilled bat maker, who with his draw knife carefully shapes the wedge at the end so that it will fit tightly in the splice of the blade. When he is sure that it will do this, and that handle and blade are in a straight line, he glues the faces and a single tap with a hammer drives the handle thoroughly home. Every bat produced has its handle fitted individually in this manner, and so carefully are the surfaces brought into contact with each other that the glue is practically unnecessary, the fit alone ensuring that the blade and handle blend into the complete bat.



Glueing slips of four canes each together to form a bat handle. The wrapping keeps the canes pressed tightly together until the glue dries. There are four slips, or 16 canes, in each handle.

Next follows the final shaping with draw knives, and in this work the skill and experience of the workmen guide them in giving both blade and handle their final form. The shoulders are cut out with the aid of spokeshaves, and when the bat is finished it is invariably within the limits of weight allowed. The average weight is 2 lb. 5 oz., although lighter or heavier bats can readily be produced in order to meet all tastes.

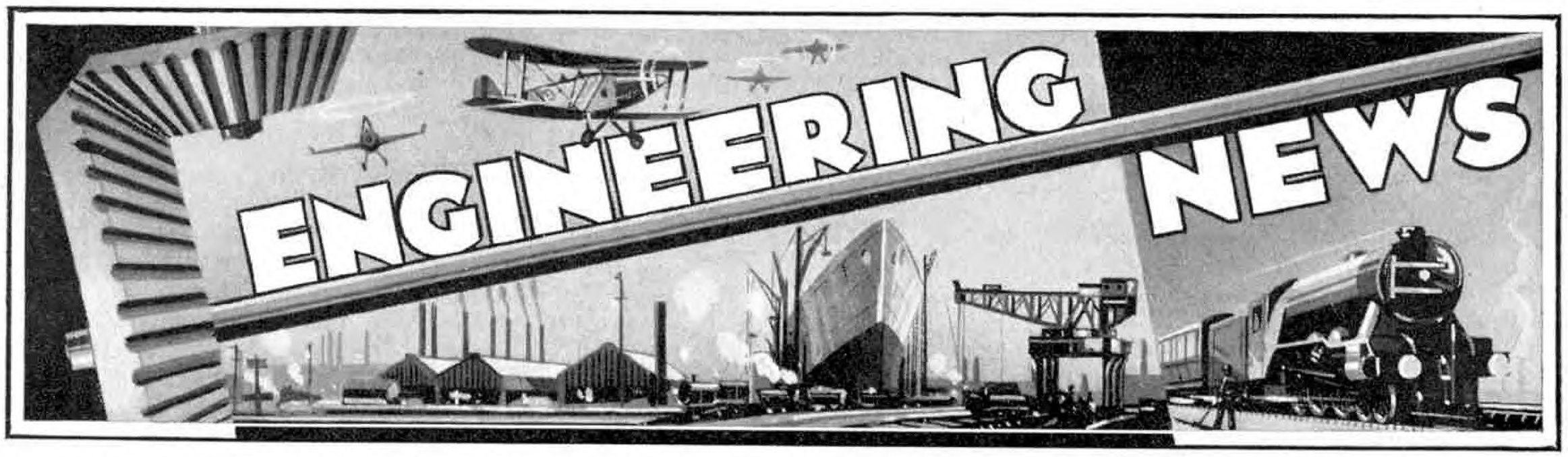
A final pressing is given to ensure that every part of the bat is thoroughly hardened, and the bat is then clamped in a vice by the handle, with the end of the blade resting on a leather pad, in readiness for finishing. The surface of the blade is smoothed down with sandpaper, and friction polished. The bat is then mounted in a lathe and the wrapping is wound on the handle, after which the rubber cover is put on. Rigorous tests and examination follow, and from these the bat must emerge successfully before the name is branded on it, and it is wrapped ready for despatch on its way to the eager cricketers in whose minds its arrival arouses hopes of good scores to come!

Cricket cannot be played with a bat alone, and naturally I was interested to see how the other parts of the necessary equipment were produced. Stumps and bails are made of ash, which is well seasoned before use in order to be certain that there will be no warping. For the stumps the square lengths are cut and turned on a lathe. The turner takes off wood until a gauge rapidly slipped over the spinning cylinder shows that it is of the correct diameter. With the stump still rotating he presses against it from the front a gauge with sharp points that mark out the length of the stump and of its various parts. Then he again takes up his chisel and quickly gives the stump its final form. The last operation is to complete the cutting of the point. This parts off the stump, which he catches as it falls from the lathe. During the operation the surface is sandpapered in order to smooth it, and all that remains is to make the groove at the head.

Bails are made in a particularly interesting manner. A square length of ash is mounted between the centres and rotated slowly while a rapidly-turning tool is pressed against it by pulling up a handle projecting in front of the machine. The pressure at first is slight, in order to take off the corners, and is steadily increased, causing the cutting tool to bite more deeply into the wood until it reaches its predetermined limit of movement, by which time the bail has assumed its final form.

Elsewhere in the same factory I probed into some of the mysteries of leg guards and gloves. The best leg guards or pads are made of buckskin, cut to shape and sewn together, lined, and stuffed with hair. Others are made of canvas. Buckskin also is used for gloves.

The stuffing of pads and gloves is of interest. For many of these horsehair is used, but the best pads are stuffed with the hair of the reindeer or elk, which comes from Russia. Another interesting special feature is the employment of cushioned finger tips in the best wicket keeping gloves. At the ends of these tips there are specially prepared shock absorbers of sponge rubber to give additional protection.



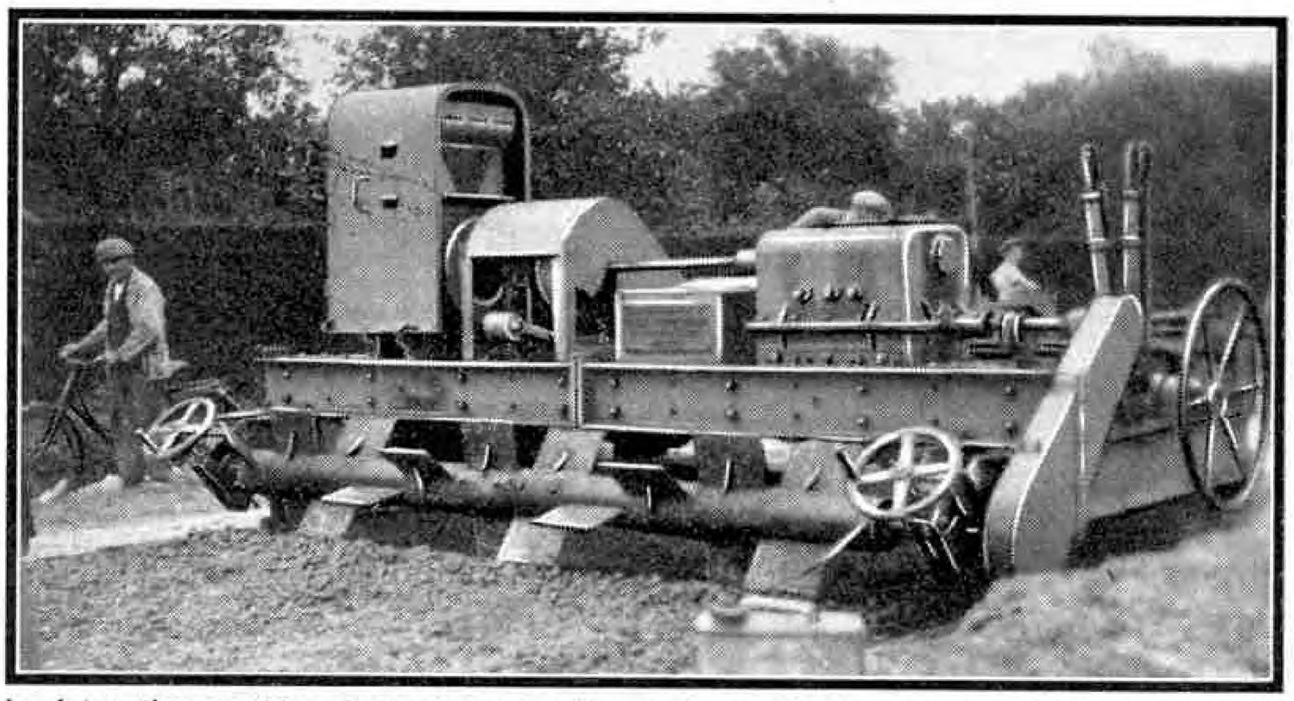
An Ingenious Roadmaking Machine

The upper illustration on this page shows a vibrating and finishing machine designed for use in the construction of modern concrete roads. It is a product of E. P. Allam and Co. Ltd., London, and its purpose is to spread out and consolidate the concrete. With it a drier mixture of concrete than usual can be employed, and this gives a road of higher strength than a wetter mixture left to settle naturally.

The machine is carried on four wheels, those on one side being flanged, and one half of the road is finished at a time, the concrete being poured between wood forms fitted with rails. The machine runs on both rails during the construction of the first half of the road, but the central form and rail is taken away for the making of the second half, the plain wheels of the machine then running on the finished concrete. For rounding curves the wheels on the inner side of the machine are disconnected from the drive. Usually the machine is driven by a 7-h.p. Lister petrol engine fitted with a radiator and housing, but if desired a Diesel engine can be installed.

The view given in the illustration is of the forward end of the machine. In front is a rotating shaft, which is provided with paddles, spaced so as to cover the whole width of the concrete, which spread out the material and level it. In the centre of the frame is a mechanically-operated beam that moves up and down at high speed. The beam is tilted slightly downwards towards the rear, and this gives it a wedging effect that consolidates the concrete both by pressure and vibration. The beam can be tilted in the opposite direction if desired so that the machine can be used to beat the concrete down twice by driving it forward and then reversing.

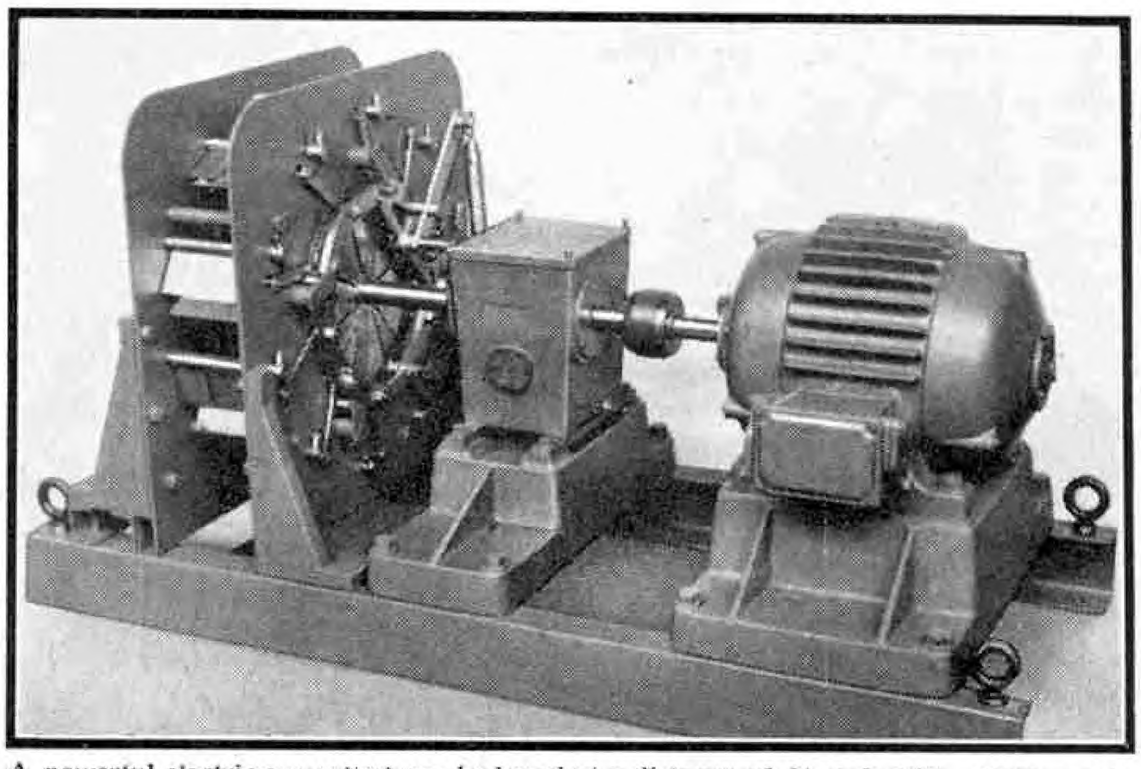
With the beam in action the speed of the machine is 7 ft. per min. forward or backward. When it is necessary to move the machine from one section to another, the mechanisms are lifted clear of the surface and the machine then can travel under its own power at a speed of 60 ft. per min.



An interesting machine designed for levelling and consolidating concrete during roadmaking operations. Photograph by courtesy of E. P. Allam and Co. Ltd., London.

A Powerful Motor Syren

The lower illustration on this page shows a powerful motor coding syren of a type that is used extensively for fire alarm purposes and for giving "start and cease work" signals at factories. Syrens of this kind are suitable also for giving warning of air raids or for emitting warning signals in harbours during fog. The apparatus forms a self-contained unit consisting of the syren proper and a 2-h.p. electric motor, and is designed to give a series of code signals varying in duration from 15 sec. to 2 min. that can be heard at a distance of 2½ to 3 miles. The signal is produced by air sucked by a fan through a rapidly revolving rotor and stator system.



A powerful electric syren that can be heard at a distance of 2½ to 3 miles. Photograph by courtesy of Gent and Co. Ltd., Leicester.

Electricity at the Empire Exhibition

Some idea of the enormous amount of electricity required for illumination and other purposes in the Empire Exhibition grounds at Bellahouston Park, Glasgow, is given by the fact that the equipment now being installed would suffice for a modern city of 500,000 inhabitants. The current will be taken from the Glasgow Corporation supply and will be distributed in the grounds from 10 substations. Over 13 miles of main underground cable have been laid, and 240 miles of wiring have already been completed. In the Palace of Engineering alone there are over 25 miles of cables.

The scheme of illumination will be very elaborate. At the top of the 300 ft. high Tower, which was illustrated on page 139 of the "*M.M.*" for March last, three great galleries have been erected, and these will be outlined at night in bands of green, red and yellow light that will be visible 50 miles away. The outlines of the main buildings also will be picked out in coloured neon lights, and the names of the principal structures will appear in illuminated letters 9 ft. high immediately daylight fades. On the front of the Palace of Industry will be fitted a gigantic electric clock, the hands and figures of which will be brilliantly illuminated.

There will also be wonderful illuminated waterfalls and pylons 30 ft. in height. The colours of these pylons will change every five seconds, while behind the cascades themselves there will be powerful lamps in four colours.

The trees throughout the grounds will be floodlighted in many colours, and festoons of coloured lights will be slung between specially designed steel flagpoles.

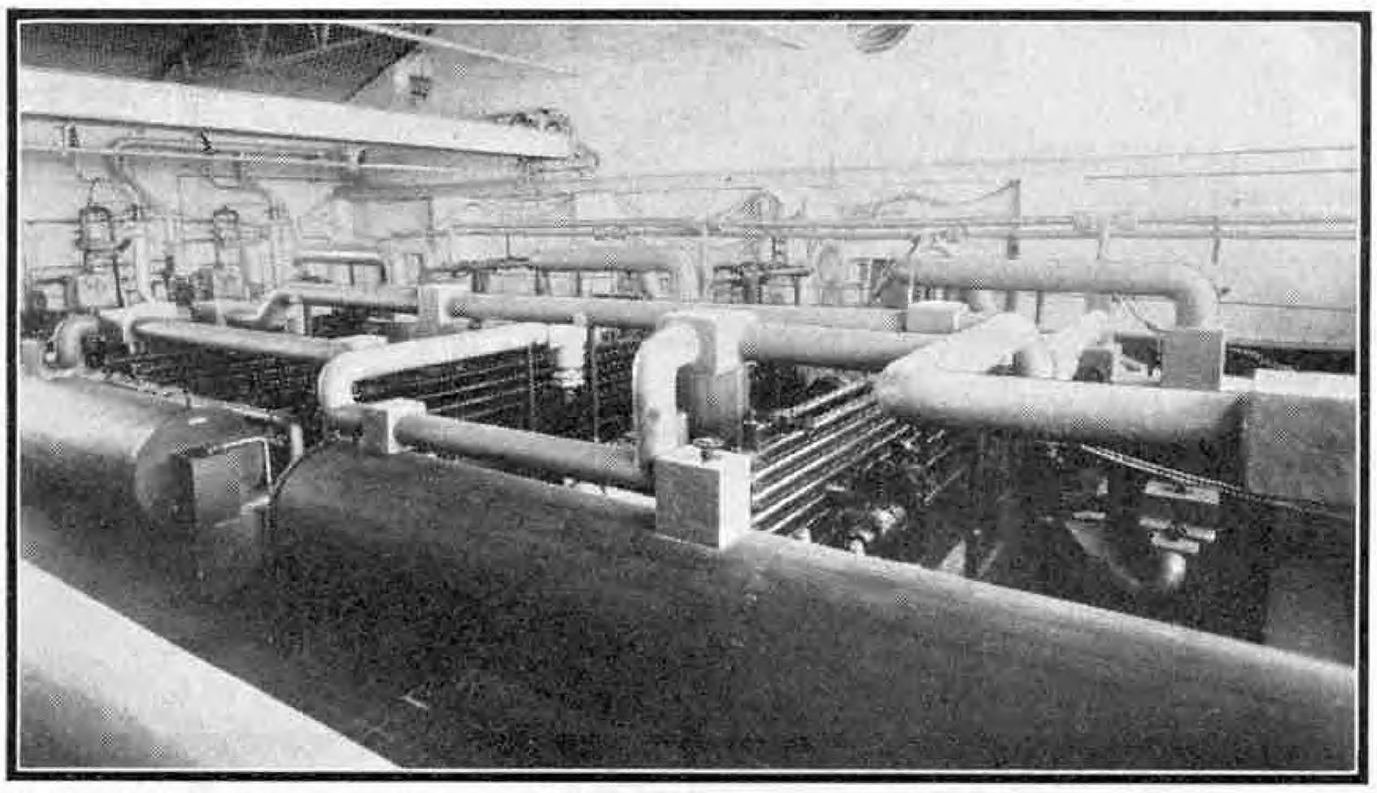
Hydraulic Jet for Coal Cutting

A Soviet inventor has developed a process for cutting and conveying coal by means of a jet of water at high pressure. Experiments have shown that a jet at a pressure of about 220 lb. per sq. in. can cut 11 tons of coal of average hardness in 8 minutes. As the coal is cut it is carried by the water into a sump and then transported to the surface.

R.A.F. Ice Making Plant in Mesopotamia

The illustrations on this page show part of a large refrigerating plant that has been erected at the new Royal Air Force Aerodrome at Dhibban, Iraq. It is used for supplying cool air for the R.A.F. hospital and wireless telegraphy station, and generally for cold storage and the production of ice. The installation is one of the finest and most complete of its kind in the world.

The plant was constructed by the Liverpool Refrigeration and Engineering Co. Ltd. at their works at Sankey, near Warrington, and consists of three electrically-driven ammonia refrigerators. The machines operate continuously day and night, and have to perform their work at a constant surrounding temperature of 125 deg. F. One of the three plants maintains 13 insulated cold stores for food and three insulated air locks at temperatures varying between 15 and 40 deg. F., according to the commodities stored in the different rooms. This plant also is capable of producing 10 tons of ice every 24 hours. The other two plants are used for air conditioning only.



A view of part of the evaporating plant of the refrigerating installation at the new R.A.F. Aerodrome at Dhibban, Iraq. For the illustrations on this page we are indebted to The Liverpool Refrigeration and Engineering Co. Ltd., Sankey, Warrington.

Exploring the Floor of the Ocean

Prof. Piccard, who gained world-wide fame by his balloon ascents into the stratosphere, is now planning to explore the bed of the ocean in a bathysphere. He hopes to reach a depth of 15,000 ft. The bathysphere will not be attached to a cable, but will be supported in the water by a cylinder containing paraffin.

As the bathysphere will be lighter than water, it will be weighted with ballast consisting of small steel shot and this will be controlled by magnets. Prof. Piccard hopes to reach a depth of 15,000 ft. in an hour and a half. The ballast will be cast off when it is desired to ascend.

Experiments will be conducted to select the most suitable metal for the sphere, and the type and strength of the glass for the windows. The first descent probably will be made in the waters of Lake Geneva, and this will be followed by others in the sea off the Canary Islands, where the depth is 18,000 ft. Under-water photographs will be taken with the aid of powerful artificial light.

Bridge Built on Screw Piles

A new railway and vehicular bridge that is being erected at Cochin, India, to connect Willingdon Island with the mainland is supported on piles made in the form of huge screws. Each pile consists of a central cast iron column encircled by a spiral of blades that form the thread, the diameters of the complete piles varying from 6½ ft. to 8½ ft. Electric capstans screw the piles into the sea bed to a depth of nearly 80 ft. below the surface of the water.

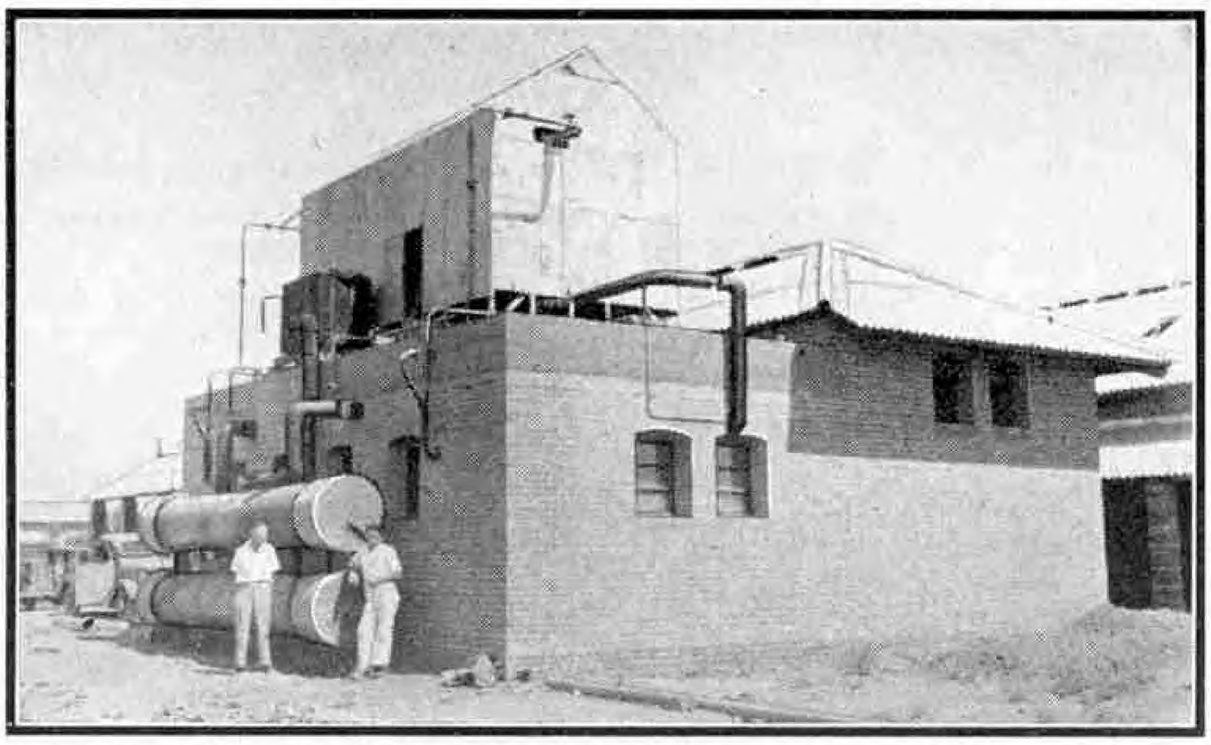
When the bridge is completed it will consist of 17 spans, and will have a total length of over 2,000 ft.

Vehicles that Unload Themselves

Motor lorries fitted with special bodies having movable floors in the form of belt conveyors are in use in the United States of America for carrying such materials as cement and gravel. The floor consists of an endless belt of durable cord rubber that travels over steel rollers placed at each end of the body. The belt is moved by means of cranks turned by hand, and when it is set in motion the load is discharged at the rear end of the lorry,

Improving Grimsby's Dock Facilities

An increasing number of large deep-sea trawlers are using the port of Grimsby and the L.N.E.R. are deepening Nos. 1 and 2 Fish Docks at the port in order to make the depth of water in them sufficient to accommodate all the trawlers using the deep-sea fishing grounds around the Faroe Islands, the Norwegian Coast, Iceland and the White Sea. These two docks will be deepened by 3 ft. 6 in. to bring them into line with the new No. 3 dock, which was opened in 1934. The large trawlers will then be able to use the entire accommodation available. The new dock is evidence of the determination of the L.N.E.R. to keep the equipment of the port up-to-date.



One of the buildings in which the ammonia compressors of the Dhibban refrigeration plant of the R.A.F. are installed, photographed during erection.

The Search for Oil in Britain

Engineers engaged in drilling for oil near Dalkeith, Scotland, are finding conditions there about as difficult as in any part of the world. Mr. A. H. Chapman, production manager of the Anglo-American Oil Company Ltd., describes the rock dealt with as "the toughest proposition" he has ever encountered.

The bit recently reached a depth of 2,500 ft. and at the time of writing is grinding its way slowly downward through very hard rock. Although the equipment in use is the most modern obtainable, the drilling speed has been reduced to 100 ft. weekly. In favourable conditions it is usually possible to drill as much as 1,000 ft. in 24 hours.

The granite-hard Scottish rock wears out three huge drilling bits daily. Changing a bit takes from two to three hours, and is a complicated procedure in which the drill pipe, to which the bit is attached has to be hauled up from the well in 90-ft. sections, one by one. Usually about 50 minutes are taken to "pull out" and 40 minutes to "go in."

Even in its early stages, the well presented some novel technical problems. At depths between 50 and 160 ft. the drill struck a layer of very porous sandstone. The mud fluid circulated through the drill pipe and bit during the drilling operation, sank into this porous rock, and the resultant loss caused the drilling crews many anxious moments, as they were constantly faced with the danger of the drill pipe sticking in the hole. To overcome this difficulty a very viscous mud was used, and this effectively sealed the pores of the sandstone and permitted circulation to be regained.

A New Electric Cable Press

An interesting press for covering electric cables with a sheath of lead has recently been installed at the Stockholm cable works of A/B Liljeholmens. The press is said to be the first of its kind in Europe. Its outstanding feature is that the lead is melted in an atmosphere of a gas that prevents oxidisation, and is delivered free from oxide to the press, thus eliminating holes and cracks in the finished sheath. The crucible is maintained automatically at the proper temperature by thermostats.

A Canal to Link the Danube with the Black Sea

The Rumanian Government has approved a scheme for the construction of a canal between the town of Cernavoda, on the Danube, and the port of Constanza, on the Black Sea Coast. The canal will take about five years to build. By using the canal the distance by water between Cernavoda and the Black Sea will be reduced by 155 miles.

Behind the Scenes in Motor Racing

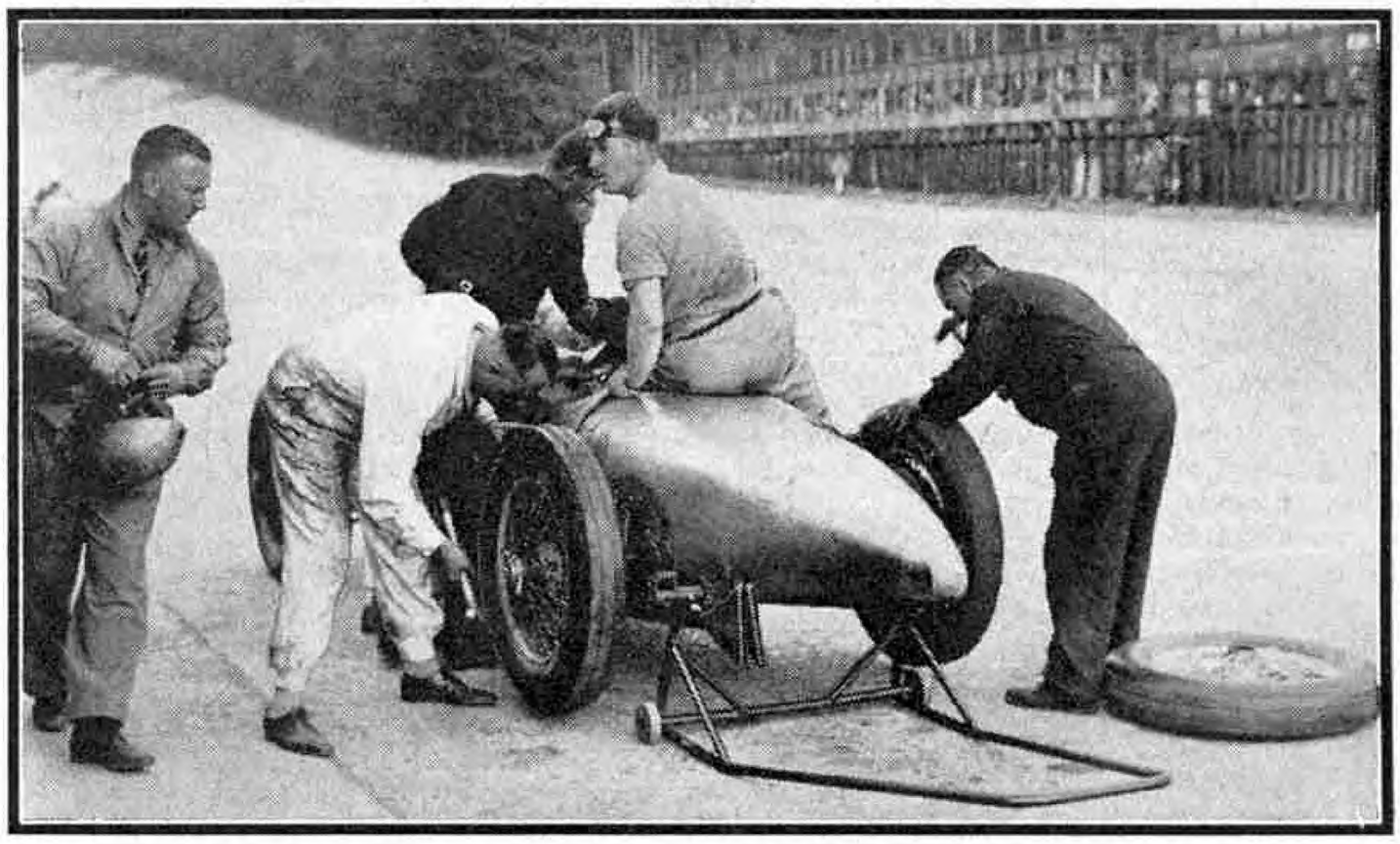
How Victory Depends upon Pit Control

By Michael Peryam

MOTOR racing is regarded by most people as an exciting if somewhat dangerous sport. If any success is to be hoped for, however, it must also become a complicated and specialised business, calling for skill and organisation of the highest quality. This is best realised by going behind the scenes in any organisation that takes part in motor racing in order to see what actually goes on.

Building a racing car is a laborious job, requiring the highest possible skill, that is begun months ahead of the race. Every part must be thoroughly tested in order to determine whether it will be capable of standing up to the stresses that will be imposed upon it, for on this may depend not only success or failure in the race, but perhaps the life of the driver.

Many people imagine that the driver alone is responsible for the running of a car once it has left the starting line. The responsibility really rests with the team manager, whose job it is to control the actions of the drivers according to the ever-changing conditions. Most of the races in this country are run on a handicap basis. The team manager therefore must know at any time during an event exactly how his cars are lying, not only in relation to their immediate opponents, but in regard to the handicap. Accordingly graphs and charts have to be drawn up, and signals prepared by means of which the team manager can transmit his instructions to the drivers as they flash by.



Changing the rear wheels and filling up with oil and petrol during a race. The back axle has been raised by means of a quick-lift jack, and the two drivers are about to change places.

At last the great day arrives, and for some hours before the race is due to start the replenishment pits are a scene of intense activity. Mechanics carefully lay out rows of tools on the counter, where they can be reached immediately if necessity arrives. Special fuel, or "dope," as it is sometimes called, is strained through chamois leather into big churns holding five gallons each; and plugs, spare wheels and cans of oil and water are laid by in handy positions.

One end of the counter is left clear for the control staff, which usually consists of a lap scorer, a spotter, and a timekeeper. The spotter is armed with tear-off pads and a host of pencils, and his job is to note down the numbers of all the cars as they pass. As each sheet is completed it is handed to the lap scorer, who marks off on his chart each complete circuit made by every car. On this chart is marked also the handicap, so that the team manager can tell to within a lap the exact position of any one of his cars in relation to the remainder of the field. It is often necessary to have a closer check on the cars than this, however, and the timekeeper therefore is armed with a battery of stop watches, with which he keeps a careful check on the times of his own cars and their most dangerous rivals.

Eventually all is set. Last minute adjustments have been made to the cars, "hard" plugs specially made to withstand high temperatures have replaced the "soft" plugs used for warming up, and the mechanics have returned to the pits. On the starting line the cars are lined up in rows according to their practice times, the fastest in front and the slowest at the rear. The starter's flag is slowly raised. There are five seconds to go, and the low mutter of the engines rises in deafening crescendo. Four seconds—three—two—one, and "They're off," the drivers jockeying for positions as they race down to the first corner.

As the noise of the cars fades away into the distance the pit staff make a final check of their equipment to make certain that everything is to hand if wanted. The spotter stands pad in hand, ready to jot down the numbers of the cars as they roar past at the end of their first lap, and the timekeeper begins to fiddle nervously with his watches.

At last the hum of the cars can be heard in the distance. The hum grows to a roar and then in a bunch the leading cars flash by like projectiles, hard on each other's tails, with the sluggards trailing off behind. The spotter must not miss one, or the whole carefully built up organisation may be rendered useless. After one or two laps things sort themselves out a little, and the drivers have time to give a reassuring "thumbs up" signal to those anxiously watching at the pits. And so it goes on for lap after lap.

Let us imagine that we are in the pit of the entrant of a team of three cars. Perhaps those anxiously watching discern the faintest irregularity in the beat of the engine of one of their cars as it hurtles past and speeds away on another lap. Has the driver noticed that odd sound in the din and bustle of the race? The team manager orders a new set of sparking plugs to be laid out on the pit counter, for plugs seem to be a probable cause of the trouble, if trouble it really is. Round come the cars again. First one and then another of the team flash by. Seconds pass, but the third does not appear, and cars that previously were lying behind it now come through. At last, with engine coughing and sputtering, No. 3 comes in sight, close in to the side and making for the pits to have the trouble rectified, whatever it may be.

Before the car has come to a standstill, mechanics are over the counter, undoing the bonnet straps.

"Plugs, I think," says the driver, and in a trice the quick detachable plug leads are pulled from their sockets. Using a special spanner the mechanics whip out the nearly red-hot plugs, toss them one by one into the pit, screw a new set quickly into position, and replace the leads. In the meantime the driver has wiped his goggles and had a drink, and he slides into his seat as the bonnet straps are fastened down.

"O.K.?" asks the team manager.

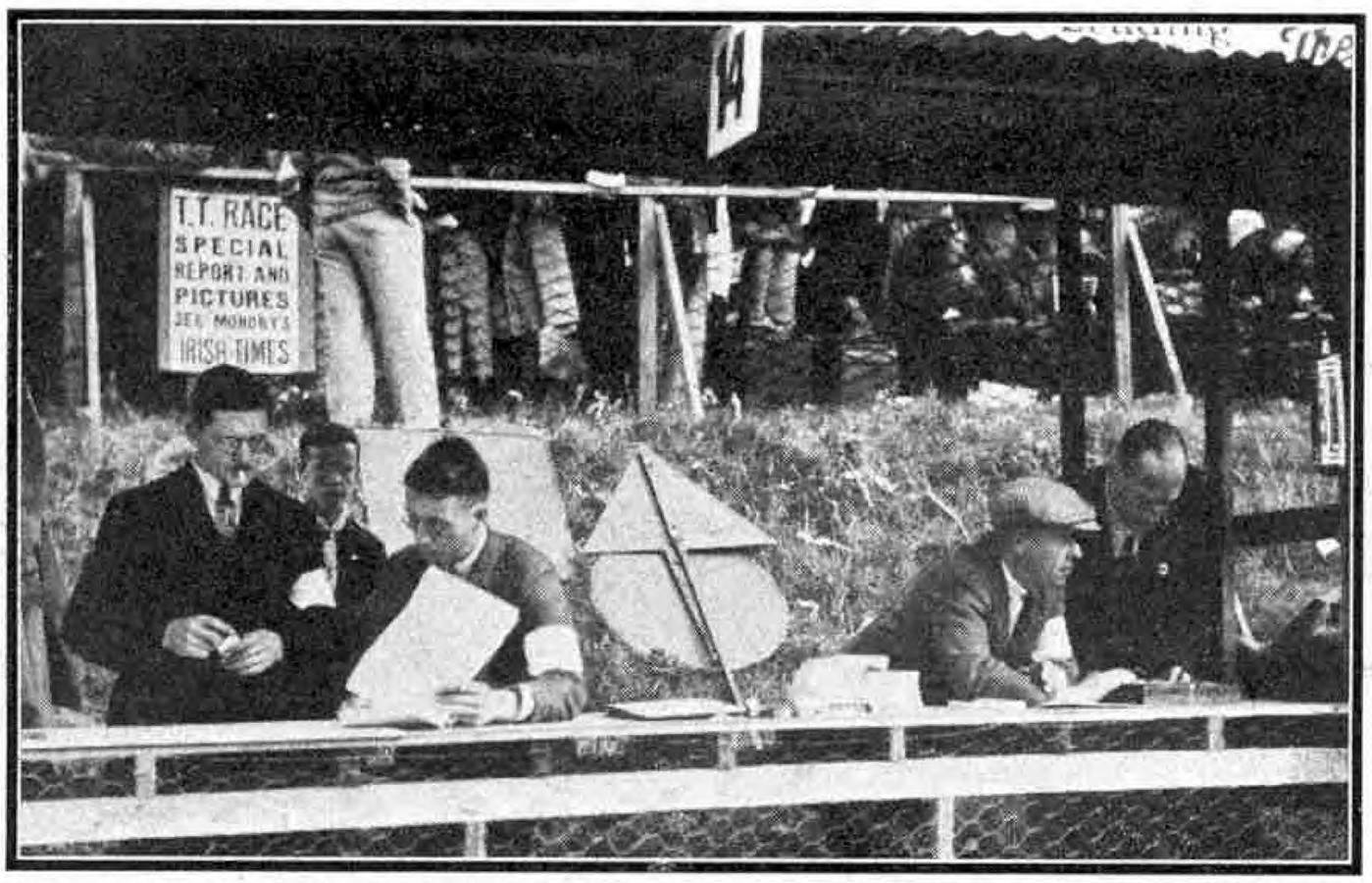
"O.K.," replies the driver. A heave and a push, the engine once again breaks into healthy life, and the car accelerates away in pursuit of the field.

Let us suppose it has been determined by a careful petrol consumpton test that the cars shall come in for replenishment at the half distance. As the time approaches cans of fuel, oil and water are laid out on the pit counter, together with wheels and quick-lift jacks. A mechanic writes a big figure 1 on a blackboard, which is attached to the end of a long pole. From a pile a signal already agreed upon is picked out, and a mechanic crouches on the counter to await the arrival of car No. 1. As it appears in the distance out go the blackboard and the signal.

The driver shows by a movement of his hand that he has received the message, and next time round he coasts quickly into the pits with a dead engine. Quick as thought, out go the mechanics, one armed with a special quick-lift jack, another with a lead hammer. A common arrangement is for one to slip the jack under the axle, while the other proceeds to undo the wheel nuts with the hammer, going round to the second wheel as soon as the first nut is removed.

Meanwhile the first mechanic removes the first wheel, and follows his partner round to remove the second. The second mechanic now goes to the counter for spare wheels, fitting first one, and then the other, and as he does so the first man tops up the radiator with water and the sump with oil.

While all this has been going on the driver has replenished the petrol tank from the five-gallon churns. His task finished, he either slides back into the cockpit or hands over the car to the second driver, for in long distance races two drivers for each car are the rule rather than the exception.



In a control pit during a big race. On the right the team manager and the timekeeper are discussing the situation. On the left are the lap scorer and the spotter. The pit signals are at the back.

All this sounds rather complicated, yet a complete refuelling and change of rear tyres is often accomplished in less than a minute and a half. In case any petrol has been spilled the car is pushed away from the pits before an attempt is made to start it; otherwise a slight backfire might have somewhat disastrous consequences.

By this time the team manager can probably form some real opinion as to how the race is likely to go. A glance at his chart shows that his cars are perhaps lying second, fifth and eighth, and are lapping in 10 min. 12 secs., 10 min. 18 sec., and 10 min. 28 sec. respectively, while the leader is lapping in 10 min. 8 sec.

"Give No. 1 the faster signal" comes the command.

Out goes the signal, and the driver of this car replies with a lap of 10 min. 7 sec. Those in the leader's pit have seen the move, and promptly give their man the faster signal. Our team manager knows that his cars still have something in hand, however, and therefore gives each the faster signal. In three laps they may have improved their positions to second, fourth and fifth. Nos. 2 and 3 are given the signal to hold their positions, but No. 1 is urged to go still faster. It is his job to win if he can, but at all events to try and make the leader stress his engine to such an extent that it will fail.

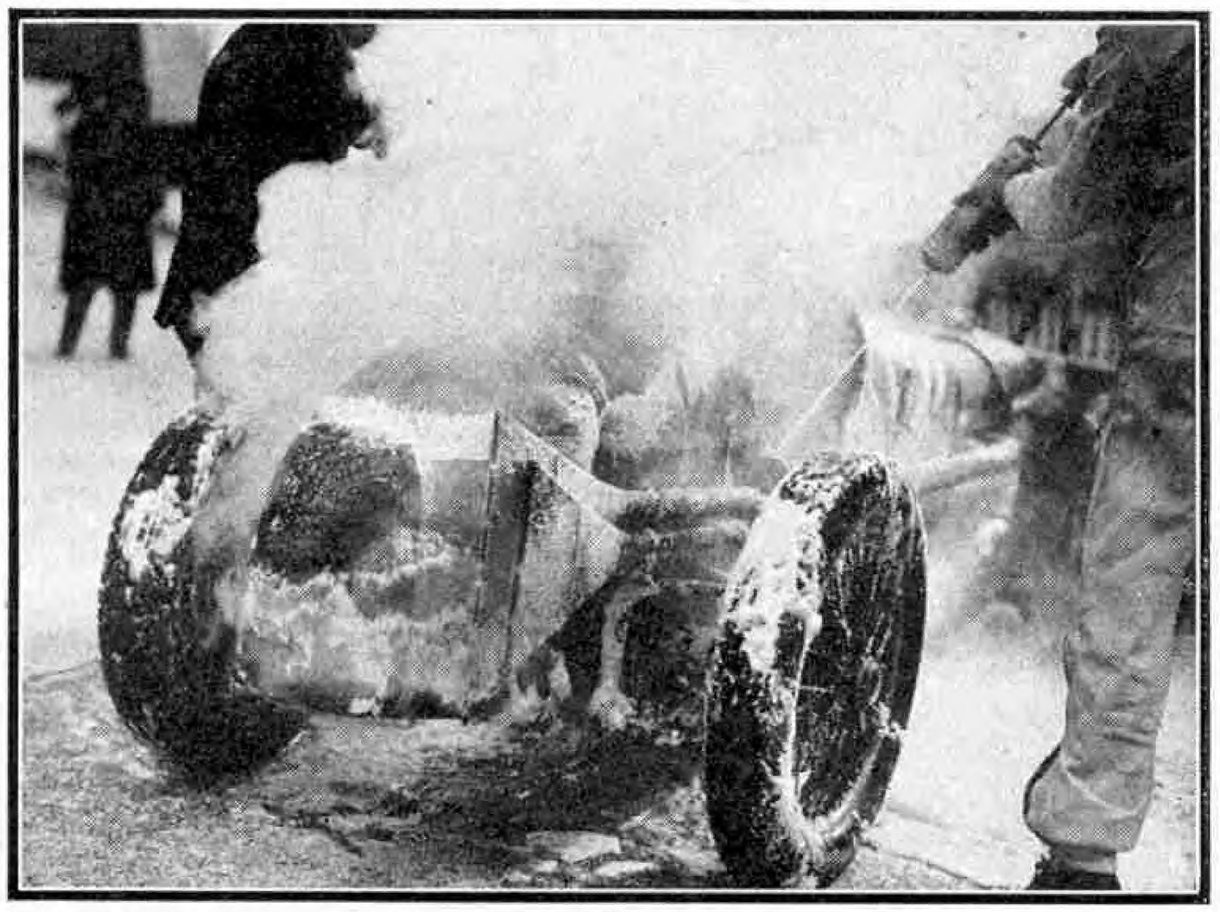
For a while it seems as though the leader will not crack. Then perhaps over the loud speakers comes a message from the other side of the course to the effect that the leader passed a certain lookout point with smoke pouring out of his bonnet, a sure sign of serious trouble. As the cars come round again No. 1 is now in the lead, with the other two cars third and fourth.

An excellent example of this sort of thing was seen during the 24-hour race at Le Mans in 1930. A strong entry of British Bentleys were fairly certain of victory if only the menace of the giant supercharged Mercedes driven by Rudolph Caracciola could be overcome. From the start, Caracciola sprinted ahead, with two of the Bentleys, driven by the late Sir Henry Birkin and the late Glen Kidston, some distance behind in second and third places. For several laps the Mercedes gradually drew ahead. Then Birkin got the signal for which he had been waiting—to try and drive the Mercedes to destruction. With a lap at 88 m.p.h., which was considerably faster than any speed so far shown by his rival, he pulled back some of the lead, but Caracciola was warned by his pit what was happening and crammed on more speed. Birkin, relentless in his pursuit, countered this move by clipping a few more seconds off his lap times, and for lap after lap the two cars thundered round, Caracciola using his supercharger more and more and imposing considerably greater stresses on his car.

At last Birkin, coming into the Hunaudieres straight, caught sight of his rival away in the distance, and knew for certain that he was catching him. With engine roaring at 4,050 r.p.m., equivalent to 124 m.p.h., the great two-ton Bentley hurtled down the straight. Then there was a crash; the tread had flown off one of the tyres! A lesser driver than Birkin would probably have eased up, knowing that he had to rely upon a shell of thin canvas on one of his driving wheels. The pace had to be maintained if the Mercedes were to be caught, however, and Birkin kept his foot down on the accelerator.

Caracciola was confident in his own mind that no one could catch him. He was deafened by the wail of his supercharger, which by now was in action practically all the time, and so did not hear Birkin behind him. Keeping to the crown of the road, he was suddenly amazed to see the Bentley roar by on the grass verge at 130 m.p.h. to take the lead. Every yard saw the faulty tyre getting weaker and weaker, but for two laps Birkin kept on, maintaining his distance in front of the Mercedes. Then the tyre finally burst, and Birkin had to make a pit stop to have a spare wheel fitted.

Although Birkin was never again in the picture, his valiant effort achieved the desired result. The remaining Bentleys were speeded up slightly, and a ding-dong struggle ensued. Hours went by, day turned into night, and still the battle continued. At 1 a.m. the Mercedes called at the pits with oil pressure trouble. Half an hour later in it came again; a battery had gone dead. Swiftly the leads were changed to the spare battery, but that had not enough power. Further investigation showed that the dynamo had ceased to work and that other things were seriously amiss. Slowly the giant was pushed to the dead car park, and the surviving Bentleys went on to fill first and second places.



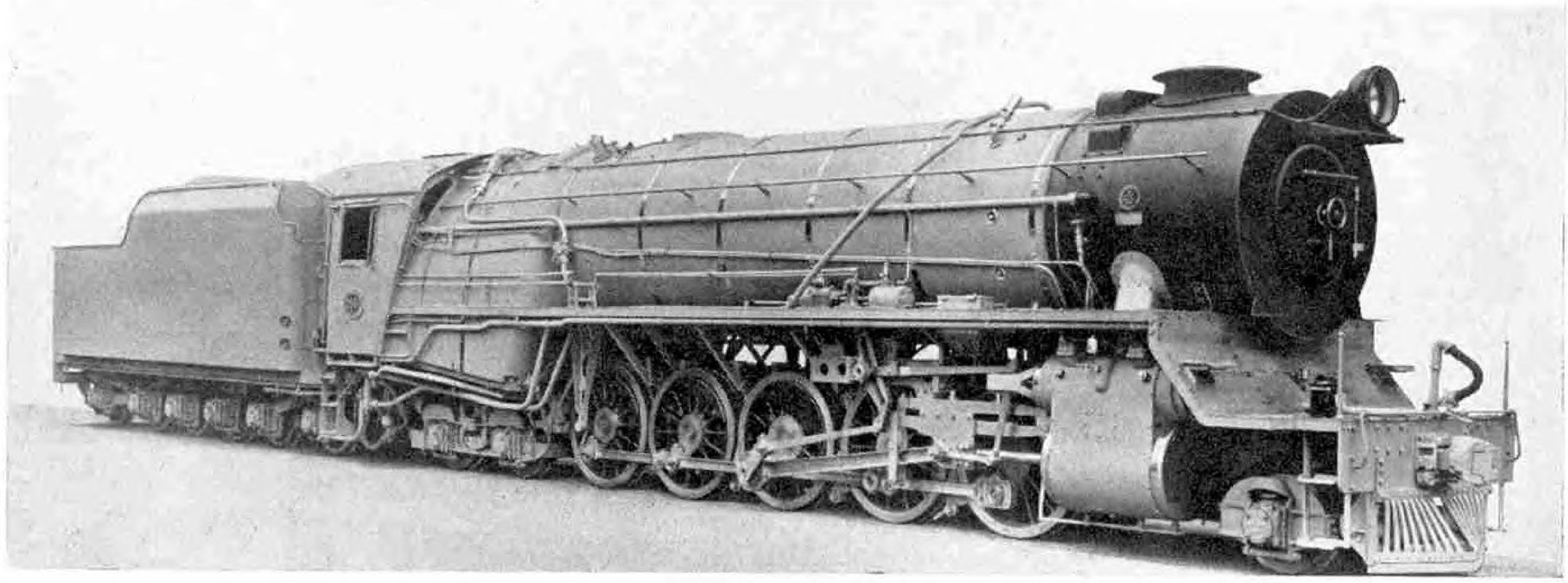
More haste, less speed in pit work. The result of filling up with petrol hastily and clumsily while the engine is running!

Undoubtedly the victory was due principally to the tremendous struggle early in the race. Over the full distance the Mercedes undoubtedly would have proved to be the faster car, but the additional stresses of an "all out" battle reduced reliability, leaving a clear field to the Bentleys, which still had something in hand.

And so it goes on to a greater or less extent in nearly every long distance race, every move being watched and countered where possible. If towards the end of a race the leading cars are within a few seconds of each other, "All out" signals are shown at the various pits. Then it is a case of 'win or burst.' Crouching well down into their cockpits in an endeavour to cut wind resistance down still further and with throttles wide open, the drivers seek to save those few precious seconds that may mean the difference between victory and defeat. On the other hand, if one car is well in the lead, it may be given the "slower" signal, in order to relieve the stresses somewhat, and make certain of winning. This then, is a glimpse behind the scenes of motor racing, one of the most exacting and highly organised sports in the world and one that provides endless thrills for the onlookers.

Giant Locomotive for South Africa

Heavy Hauling over Lightly-Laid Lines



FOR hauling heavy loads, especially on lines with steep inclines, engines with six or more coupled wheels are necessary in order to obtain greater adhesion, or grip on the rails. For heavy freight service, and in certain cases even for passenger trains, the eight-coupled locomotive is used. Engines with 10 coupled wheels also have been built. These are comparatively rare, however, and are chiefly to be seen overseas, especially in the United States, but there have been two examples on British railways. One of these is still in service. It is No. 2290 of the L.M.S., which was designed for the purpose of banking trains up the Lickey Incline of 1 in 37 on the Bristol and Birmingham route.

In view of this there is special interest in an experimental locomotive with 10 coupled wheels that has been introduced on the South African Railways. The engine is illustrated on this page. It has the 2–10–4 wheel arrangement, and is a giant for the 3 ft. 6 in. gauge of the S.A.R., its weight in working order with its tender being more than 171 tons. It is intended for hauling heavy loads over sections where the rails weigh only 60 lb. per yd., for the use of so many wheels enables the weight of this powerful engine to be well distributed. The locomotive was built by the North British Locomotive Company, of Glasgow, to the design of Mr. A. G. Watson, formerly Chief Mechanical Engineer of the South African Railways, and now retired.

The engine has bar frames, each of which extends in one piece from front to rear buffer beam. There are two cylinders, each 24 in. in diameter and with a piston of 26 in. These are on the outsides of the frames and each, with the valve chamber above it, is cast solid with one half of the smoke-box saddle. The piston valves have a travel of 12 in., and are actuated by Walschaerts valve motion. Steam-operated reversing gear of the standard type used on the South African Railways is fitted.

The huge boiler has a diameter of 6 ft. 7½ in. at fire-box end and 6 ft. 3¾ in. at the front end. The smoke-box includes a device for preventing sparks from being thrown out of the chimney. The fire-box is round topped, with a wide grate that has an area of 62.5 sq. ft. and is of the rocking type with a hopper ashpan. The firing is carried out by means of a mechanical stoker.

The 10 coupled wheels have a diameter of 4 ft. 6 in. Owing to the exceptional length of the engine the leading pair have been so designed that they can move ⅞ in. to each side, and the third and fourth pairs have no flanges. In addition the spacing between the coupled wheels has been made as small as possible. The purpose of these arrangements is to make the engine flexible enough to run on curves of 275 ft. radius, the gauge at such points being widened out to make it ¾ in. above normal.

The above illustration shows well the massive lines of the experimental 2-10-4 locomotive, No. 2551, described in the accompanying article. The engine is intended for heavy service on lightly-laid sections of the South African Railways, and was built by the North British Locomotive Company Ltd., to whom we are indebted for our photograph and information.

The front two-wheeled pony truck is fitted with 2 ft. 6 in. diameter bogie wheels and is of the sliding type with coiled check springs. The rear four-wheeled bogie, which also has 2 ft. 6 in. wheels, is pivoted at the front end. Coiled side check springs also are used for the rear bogie. A steam brake is fitted to the engine, and the first three pairs of coupled wheels are fitted with brake blocks in the rear.

The tender holds 10 tons of coal and 5,750 gallons of water. It is of unusual design, for it is carried on six pairs of wheels, grouped in what we may term a "2–8–2" formation. There is a two-wheeled pony truck at each end, and between these are the remaining eight wheels mounted in a rigid frame. This novel arrangement has been adopted because of the length of the tender. Its wheelbase is 22 ft. 3 in. long, but it can readily negotiate the sharp curves that abound on many sections of the railways on which it is to be used.

Another interesting feature of the tender is that roller-bearing axle-boxes are used. The water tank is welded, and the coal bunker is of the self-trimming type and the total weight of the tender in working order is 65 tons, 16 cwt.

The Hardening of Steel Surfaces

How Engineers Prevent Wear

By a Metallurgist

THE problem of wear is a very important one to the engineer, who has to design parts that will withstand the constant strain to which they are subjected in use without losing their shape and size. It is easy to see that the gear-box of a motor car would not give very long service if the gears were not made to resist the wear due to the constant engagement of the gear teeth. Some treatment of these and similar parts is necessary in order to give them a very hard surface that will withstand wear, and yet will not make them brittle and liable to crack under heavy loads. Certain types of steel can be subjected to a process of heat treatment that makes them hard on the surface and tough in the centre. This process is called case-hardening, and there are several methods of carrying it out.

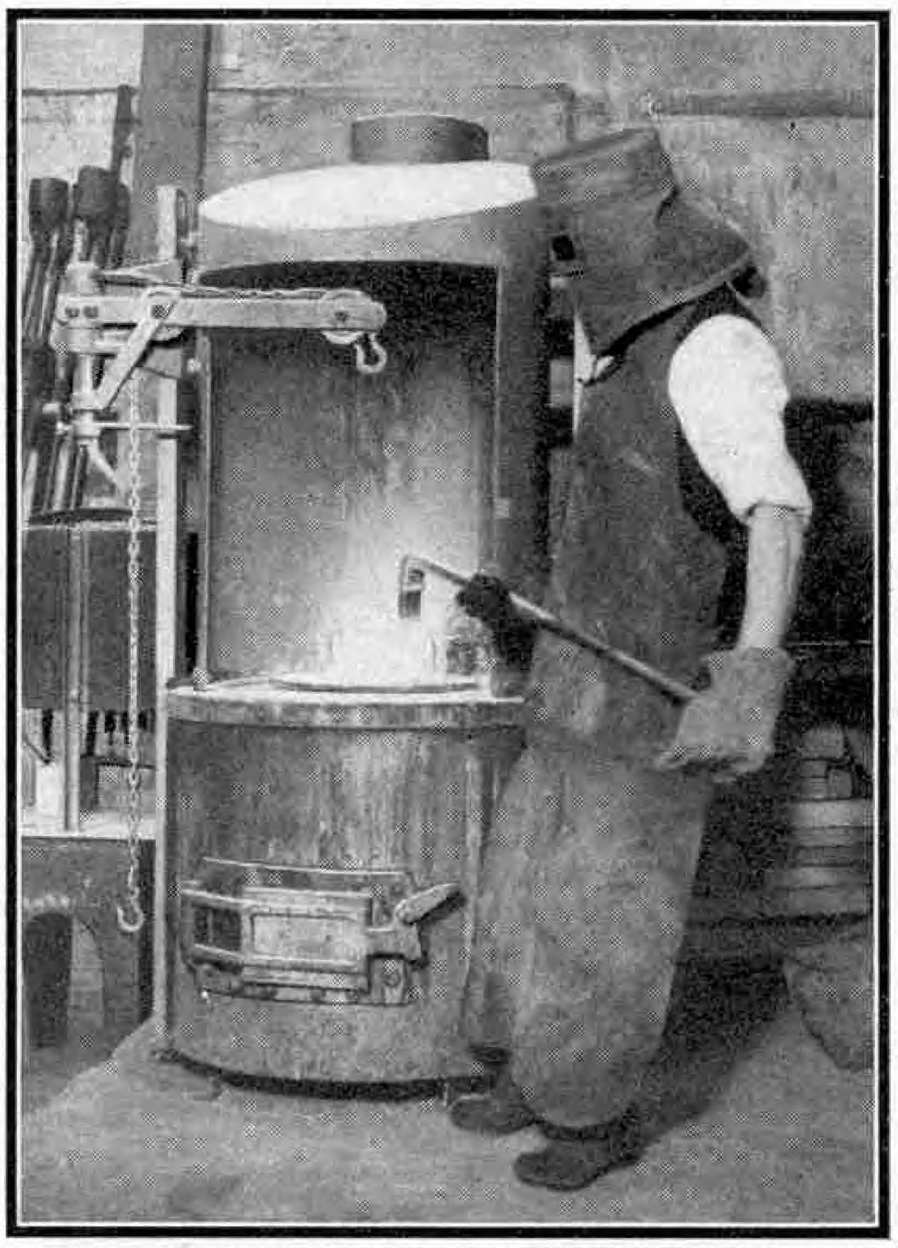
A few words of explanation about steel itself will help to make case-hardening processes clear. Steel is an alloy of iron and carbon, the proportion of carbon ranging from about .1 per cent. to nearly 2 per cent. Steel which contains only .1 per cent. of carbon will not harden appreciably if it is heated until it is bright red in colour, and is then quenched by plunging it into cold water. If the proportion is 1 per cent., however, the steel will harden to such an extent with the same treatment that it will snap as easily as glass.

Suppose now that a piece of steel containing .1 per cent. of carbon is treated in some way so that an envelope of carbon steel with 1 per cent. is produced on its outer surface. When it is quenched in water from a bright red heat, the thin envelope will then harden, but the inside or core of the steel will remain comparatively soft and tough. This is the process known as case-hardening.

Perhaps the most common way of giving steel a hard casing is pack-hardening. In this the parts to be treated are placed in a wrought iron box, with a special compound packed round it that contains the carbon required. This usually is in the form of wood charcoal, with a small proportion of barium carbonate. The box is then covered with a wrought iron lid and sealed up with fire-clay, after which it and its contents are heated for several hours in an enclosed furnace at a temperature of 900 deg. C. Carbon then diffuses into the outer surface of the steel, the depth to which it penetrates depending on the time. The operator of the furnace can judge by experience how long is required to produce a coating of the required thickness.

A test piece of steel bar about ½ in. in diameter and 3 in. to 4 in. long is placed alongside the components in the box so that it receives the same treatment. When it is thought that carbon has penetrated deeply enough the box is removed from the furnace and the test piece taken out, quenched and fractured. The depth of the case on it can readily be seen, and the heating is continued if this is insufficient.

When the test piece shows that the case is deep enough the parts are removed and quenched in cold water. This hardens the case, which is rendered rather coarse-grained, however. In order to remedy this defect, the parts are re-heated at a temperature of 760 deg. C. and again quenched in water.



A furnace in which steel parts are case-hardened by the cyanide process. The furnace man is well protected from splashes of molten cyanide as he removes the parts in readiness for quenching.

Another method is the cyanide process, in which molten sodium cyanide is used instead of charcoal compound as the source of carbon. The type of furnace used is shown in the illustration on this page. It is a steel structure lined with fire-bricks and heated by gas, with an air blast from an electric blower. The sodium cyanide is contained in a steel pot, into which the parts to be hardened are lowered by means of a chain or, if they are very small, in a steel ladle that has holes in it. The time required for the penetration of carbon into the steel is somewhat shorter by this method than by the one previously described, as the cyanide comes into immediate contact with the metal.

Dipping into the bath is an electrical instrument for measuring the temperature. This is known as a pyrometer, and wires from it lead to a very sensitive instrument some way from the furnace that records the temperature. The working temperatures are the same as in the pack-hardening method and the reheating is done in the same furnace, for no carburisation takes place at the lower temperature of 760 deg. C. used, and so there is no increase in the depth of the hardened case.

The removal of the parts and quenching is not a job for a novice, and a protective helmet, gloves and apron are worn by the furnace man to protect him from fumes and splashes of the molten cyanide, which is poisonous. The parts are tipped out on a wire tray hinged to the side of the water tank, which is sunk in the floor. A second man then tips up the tray and shoots the parts into the water with as little splashing as possible.



BOOKS to READ

Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/– for postage to the price. Postage on different books varies, but any balance remaining will be refunded.

"The London Zoo"

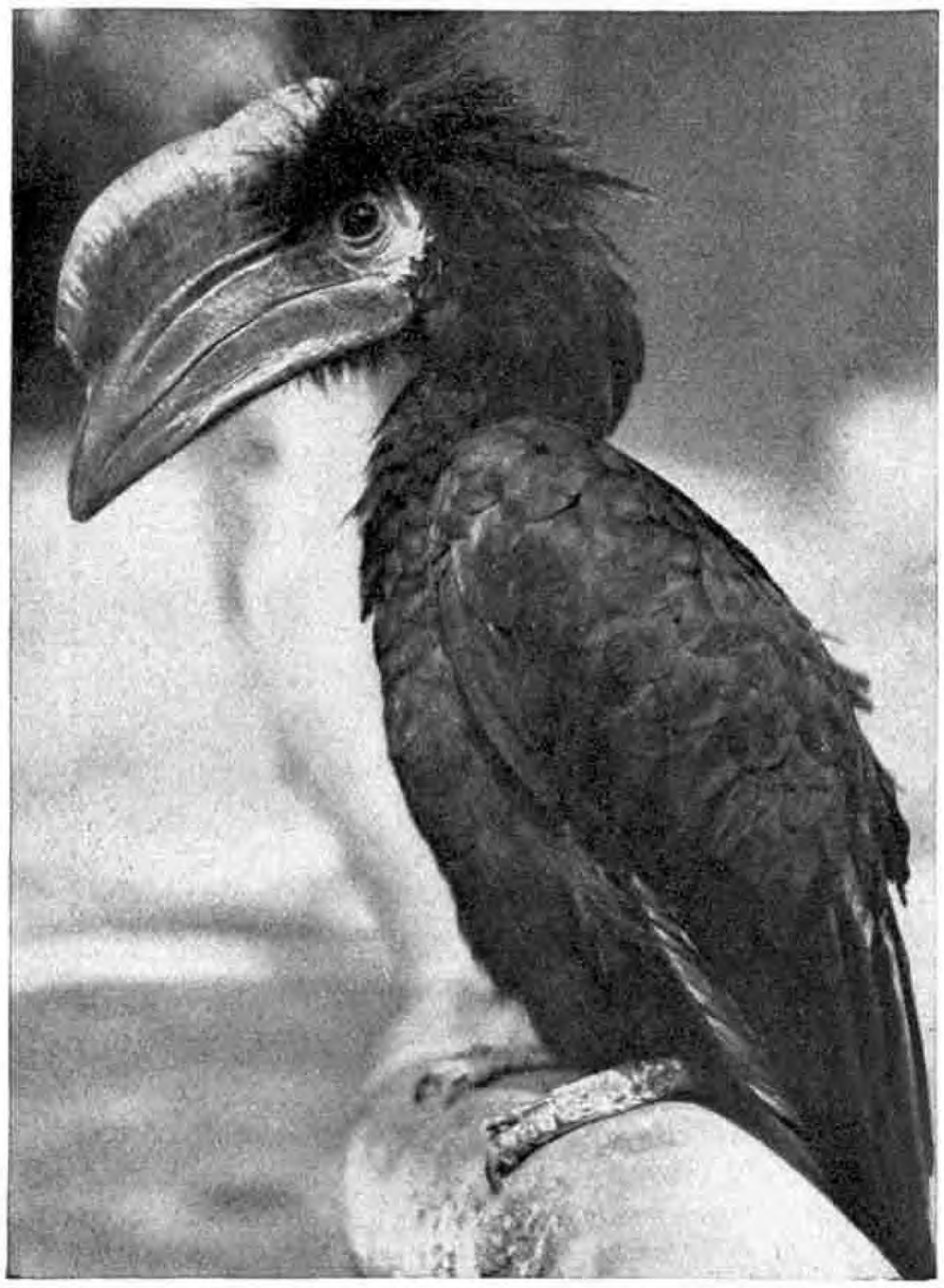
By E. G. Boulenger. (Dent. 5/– net)

Here is a book that will appeal very strongly to every reader of the "*M.M.*," young or old. It is written by an authority who knows and understands the many animals in the London Zoo, and describes brilliantly a host of interesting unfamiliar creatures in addition to well-known favourites. Visitors to the famous Gardens in Regent's Park will find these far more attractive if they are familiar with Mr. Boulenger's stories, and other readers will gain from them a good idea of the marvels to be seen there.

After explaining the origin of the Zoo, and giving interesting details of the manner in which it is run, the author deals in turn with the various sections of its very extensive collection. It is impossible in the space available to follow him through each of the houses and enclosures, from the home of apes and monkeys where he begins his tour to the Insect House, but there is something for every reader, whatever his special liking may be. Some will turn at once to the chapter dealing with the Elephant House, where they will read of the famous giant Jumbo, and of the even larger Jingo, both African elephants. Others will be more attracted by the stories told of lions and tigers, and it is satisfactory to read the opinions of experts that lions in captivity, well-fed and sheltered from the struggle for existence, live comfortably to ages that they could not attain in the wild state. And so the procession continues, with bears, apes and monkeys, giraffes, zebras, wolves, sea-lions, kangaroos, reptiles, and a host of smaller creatures.

Birds take up a large proportion of the space, and rightly so, for they are of perennial interest, particularly the quaint penguins and pelicans, the toucan and the black hornbill illustrated on this page, together with the birds of paradise and other gorgeously-coloured inhabitants of the Bird House. A fascinating chapter describes the inhabitants of the Zoo's wonderful aquarium, a triumph of planning and organisation, and finally the author gives us glimpses of Zoo nights, when many sleeping boxes yield up their tenants and the darkness is pierced by flashing red, green and yellow eyes.

The book is well illustrated by 60 full-page plates in photogravure.



The black hornbill, the largest inhabitant of the Bird House at the Zoo. From "The London Zoo," reviewed on this page.

"Knots, Splices and Fancy Work"

Chas. L. Spencer

(Brown, Son and Ferguson Ltd. 6/6 net)

Mr. Spencer's excellent book on this fascinating subject has now reached its third edition, in which it has been enlarged and made even more interesting by the addition of many new examples. The great days of the art of knotting and splicing came about the middle of the last century, and the passing of the sailing ship led to its decline. Mr. Spencer therefore is doing splendid work by putting on record this extensive collection, which now includes more than 240 well-arranged examples, a large proportion of which have never previously been described in English. The knots dealt with are well described, and illustrated by 350 drawings.

"Strange Birds and Their Stories"

By A. Hyatt Verrill. (Harrap. 10/6 net)

This is the fourth of a series in which Mr. Verrill has already told many wonderful stories of seashells, insects and reptiles. The marvels of bird life that he now unfolds are no less fascinating, and he has dealt only with birds that can readily be watched in their natural haunts, or in zoological gardens and museums, so that most of his readers will be able to see for themselves the strange creatures he describes.

The author begins with some of the mysteries that bird life presents. The most remarkable of these is migration, and we are given many surprising instances of the sudden disappearance of birds from one locality and their reappearance in some far distant country without having been seen at any intermediate place. Many of these movements take place as regularly as those of a railway train. There is equal mystery in the long journeys of other birds that fly thousands of miles across the trackless oceans.

Then we read of birds that play hide-and-seek, matching their often vivid colouring and patterns to their backgrounds so that they are practically invisible. Feathered fishermen are described, and we find that there are pirates who wait for these to capture their prey and then swoop down to rob them. Birds that shave, others that fight and dance, and some that use their wings like a second pair of feet are among the other wonderful creatures that Mr. Verrill deals with, and attractive chapters deal with such matters as the law courts that birds hold to try those of their own kind who have been guilty of some bird crime, and the strange partnerships that birds form with other creatures. The partnerships seem to follow a regular rule of nature. The best known example is the one between the crocodile and the white egret, which acts as the former's dentist, venturing fearlessly into its wide open mouth in order to pick its teeth clean.

The author describes a flamingo city in a remote spot in the Bahamas, where as many as 20,000 of these strange birds form an almost solid mass of red covering the landscape, and rise in a vast red cloud if they are disturbed. Bird calls and sounds provide other interesting stories, and the book ends with accounts of the dodo, the great auk and other strange birds that have vanished. The most astonishing case is the extermination of the passenger pigeon. A century ago flocks 50 to 100 miles long were common in North America, but to-day there are none.

The book is illustrated by three excellent plates in colour, three other full-page plates and many drawings.

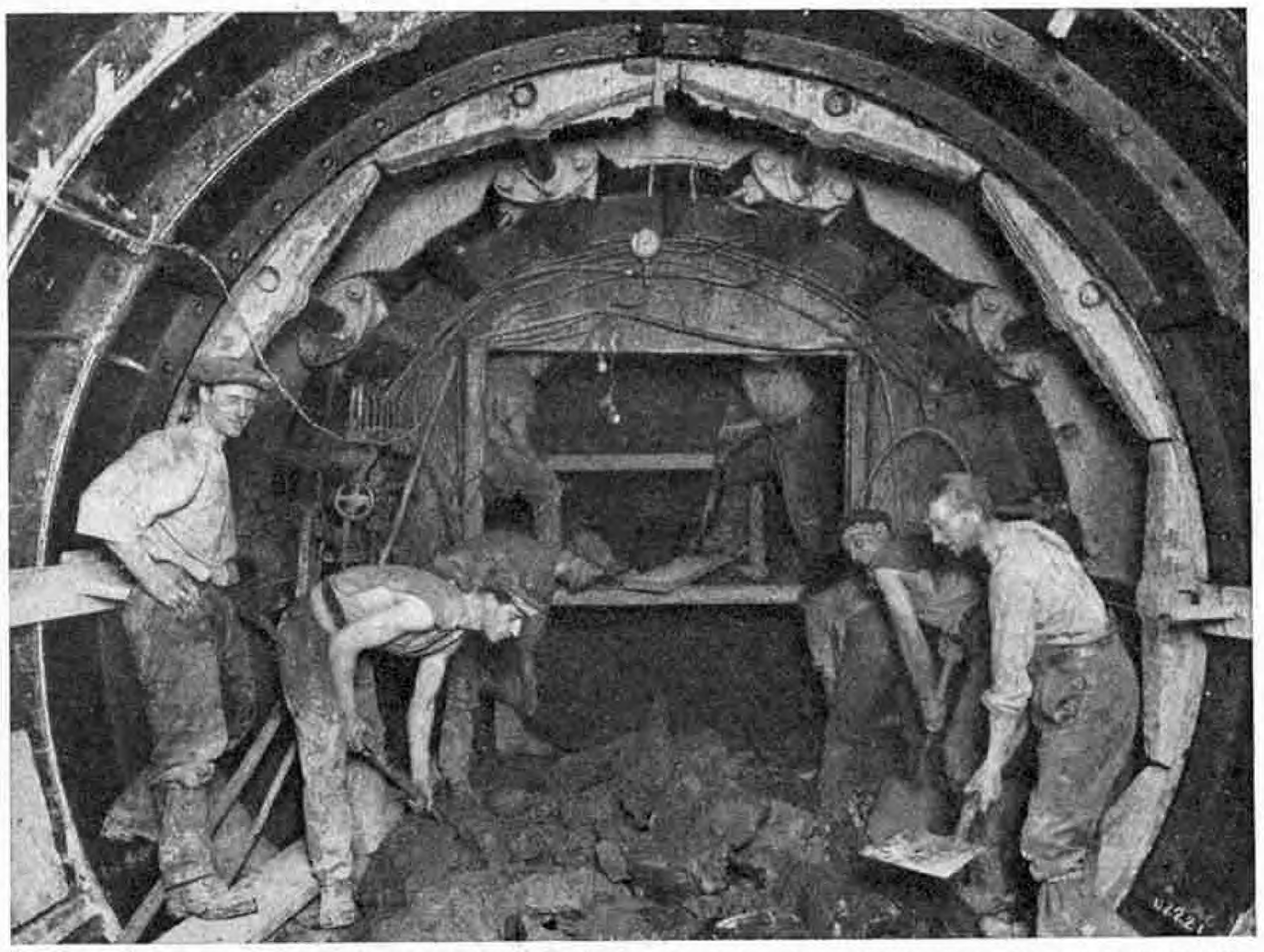
"Boys' Book of Tunnels"

By CHARLES BOFF. (Routledge. 6/- net)

There is romance in a hole in the ground when this represents the efforts of the engineer to overcome some difficulty, or to give access to some form of wealth, and Mr. Boff has endeavoured with success to convey some of this romance to his own readers. He does not go deeply into technicalities. Nevertheless he gives an adequate account of tunnelling operations of all kinds in various parts of the World, and every page contains some outstanding facts or stupendous figures showing what triumphs man has achieved in this work.

To the ordinary boy the title of the book will suggest a railway tunnel, the type with which he is most familiar. Mr. Boff deals thoroughly with this kind of underground highway, describing the construction of the G.W.R. Box Tunnel and of longer and more difficult bores through the Pennines, the Alps, and the Rockies. He then explains how the tubes through which underground railways pass are constructed, and shows how the line for these is laid out in the darkness below ground and maintained with mathematical accuracy. Next he turns to tunnels bored to divert rivers, to reach and exploit coal and gold seams, and to take railway or road traffic under wide waterways, illustrating his accounts by means of famous examples such as the Severn and Mersey Tunnels and the four immense tubes by which the Colorado River was diverted from its bed to enable Boulder Dam to be erected. He has stories to tell of Nature's tunnels, and the boring of what the author calls vertical tunnels which tap vast stores of coal and oil, also comes within the scope of the book. Mr. Boff finishes his work with stories of the astonishing efforts of the tunnellers of bygone ages, who groped their way slowly and painfully through the Earth.

There are 32 full-page illustrations of various features of tunnelling work.



The Greathead shield at work during the boring of a London tube. The shield is driven forward by hydraulic rams. From "Boys' Book of Tunnels," reviewed on this page.

"A Dictionary of Wood"

By E. H. B. BOULTON, M.C., M.A. (Nelson. 3/6 net)

Practical workers in wood will welcome this dictionary, which gives practical details of about 100 species of timber. It is arranged alphabetically and two pages are devoted to each wood, one having on it an illustration showing its grain and general appearance and the other giving its origin and general properties, with other information that will allow the best use to be made of it and guide the woodworker in his choice. The book is published in conjunction with the Timber Development Association.

"Engineering Workshop Manual"

By ERNEST PULL, R.N.R.M.I.Mech.E. (Technical Press Ltd. 3/6 net)

The present volume is the sixth edition of Mr. Pull's valuable handbook, which has been considerably revised and enlarged. It is of a convenient size to carry in the pocket and provides in small space practical information that should be known to all apprentices, improvers and journeymen engaged in engineering workshops.

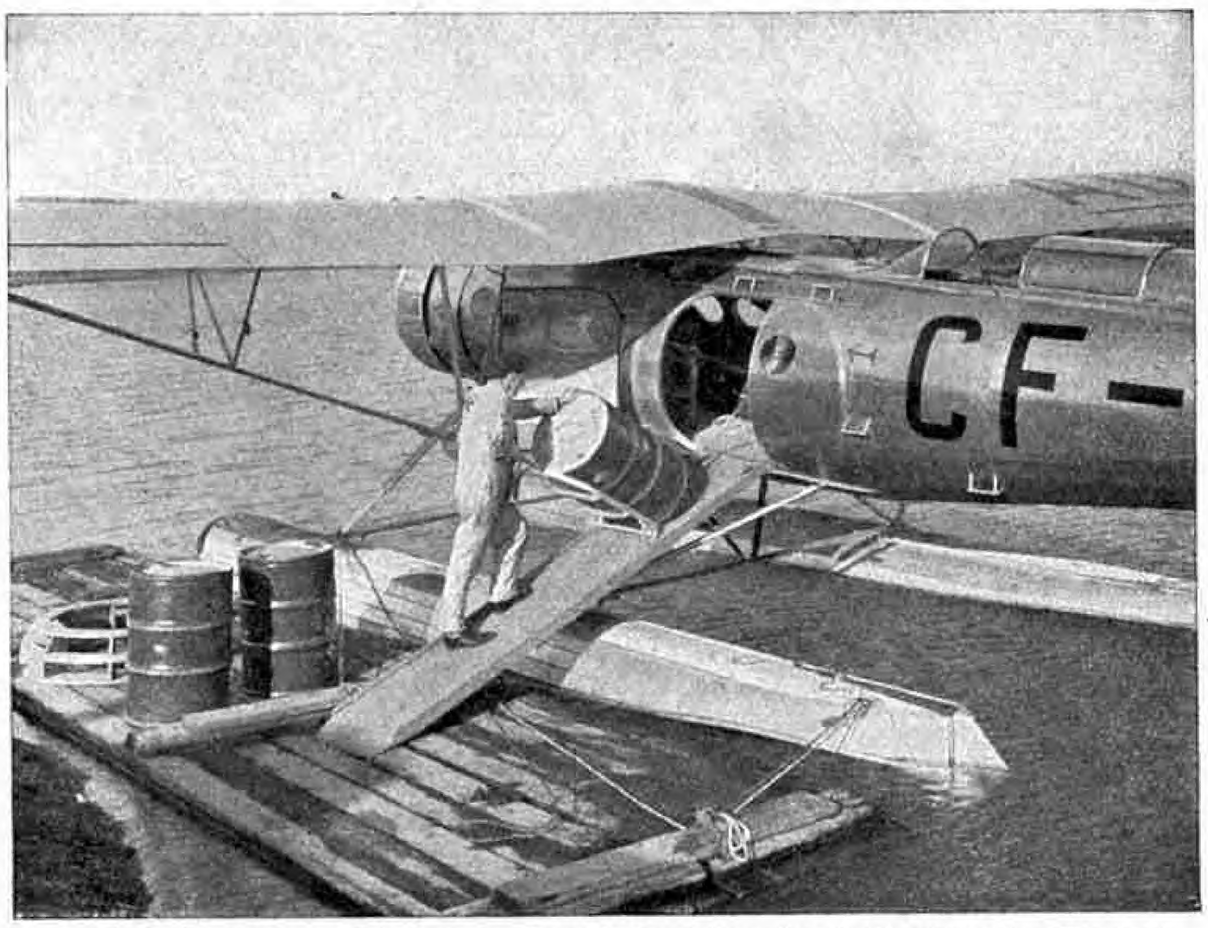
Every side of the workshop practice is thoroughly but concisely dealt with. The book begins with chapters on workshop mathematics and valuable accounts of iron, steel and other metals, and of their annealing. Then follow successive chapters on workshop tools and gauges, lathe work, including screw cutting, planing and shaping, milling and gear cutting, with sections on precision grinding and taper turning. In every chapter useful formulæ and tables are given, and there are 140 illustrations.

"Red Ben"

By J. W. LIPPINCOTT. (Harrap. 3/6 net)

Red Ben is a red fox, living in the Pine Barrens of New Jersey, who has all the cunning of his kind. We follow his adventures with keen interest, tinged by anxiety for his safety, particularly when he is being hunted, but our fears prove groundless, for with great skill he switches the baying hounds on to the trail of an old grey fox with whom he is perpetually at warfare. We see him at rest in the woods, or hunting for food at night, and finally follow him down to the sand dunes of the seashore, from which he returns to find a mate and to rear families of little foxes without disturbance, for the farmer who was his most persistent enemy has given up the fight in disgust.

The book gives wonderfully interesting descriptions of wild life in the woodlands. Everything is seen through the eyes of Red Ben himself in a manner that shows how thoroughly the author has entered into the spirit of the scenes he describes. Mr. Lippincott has written many books dealing with the creatures of the American wilds, and in his story of Red Ben, which is particularly suitable for younger boys, he has excelled himself. There is a coloured frontispiece and six excellent full-page drawings in the text that help readers to visualise the events described in the story.



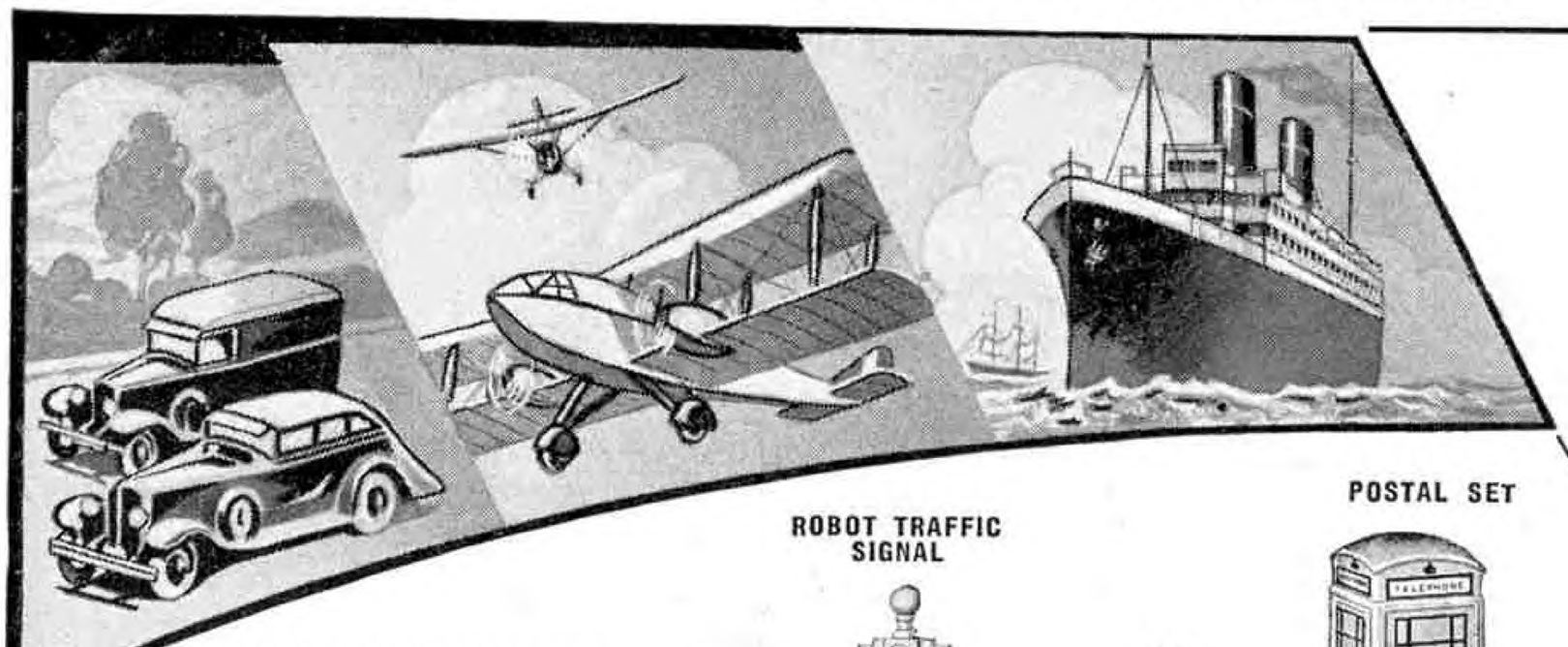
Loading a Fairchild Super 71 seaplane. From "Planes Over Canada," reviewed on this page.

"Planes Over Canada"

By Capt. A. H. SANDWELL (Nelson. 2/6 net)

Captain Sandwell has first-hand knowledge and experience of flying in Canada, and is well qualified to write its interesting and exciting story, in which there are blizzards, forest fires and Arctic cold to add to dangers in the air. He begins with accounts of the first aeroplane flight in Canada and of the achievements of Canadian pilots in the Great War, and then turns to the introduction of aeroplanes for aerial survey and photography, and for patrolling forests. He explains how aircraft came to be used instead of dog teams by the Royal Canadian Mounted Police, fur trappers and mining prospectors, and without exaggerating in any way tells many thrilling stories of danger, difficulty and success in such flying.

The development of commercial air services in Canada has not reached the highly organised state of those in England or the United States. What has so far been accomplished in this direction is briefly and accurately summarised in the closing chapters of the book. There are seven full-page plates illustrating various interesting phases of flying in Canada.



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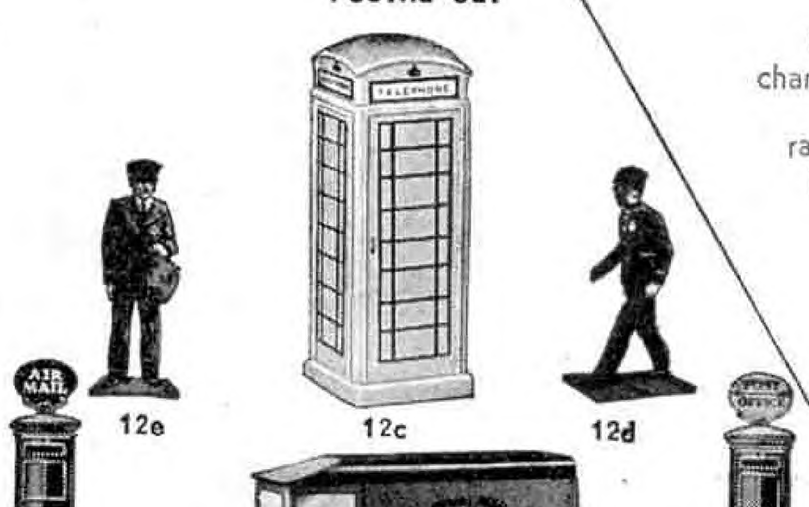


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Dinky Toys No. 62k
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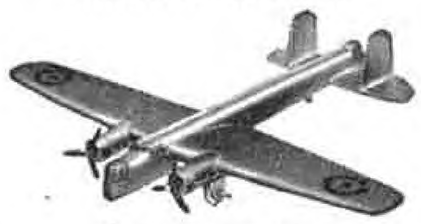
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Realistic model of Thomson Bros. Tender used for refuelling aeroplanes at aerodromes.
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Fitted with opening
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(Made in the Meccano in Paris)

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Varieties

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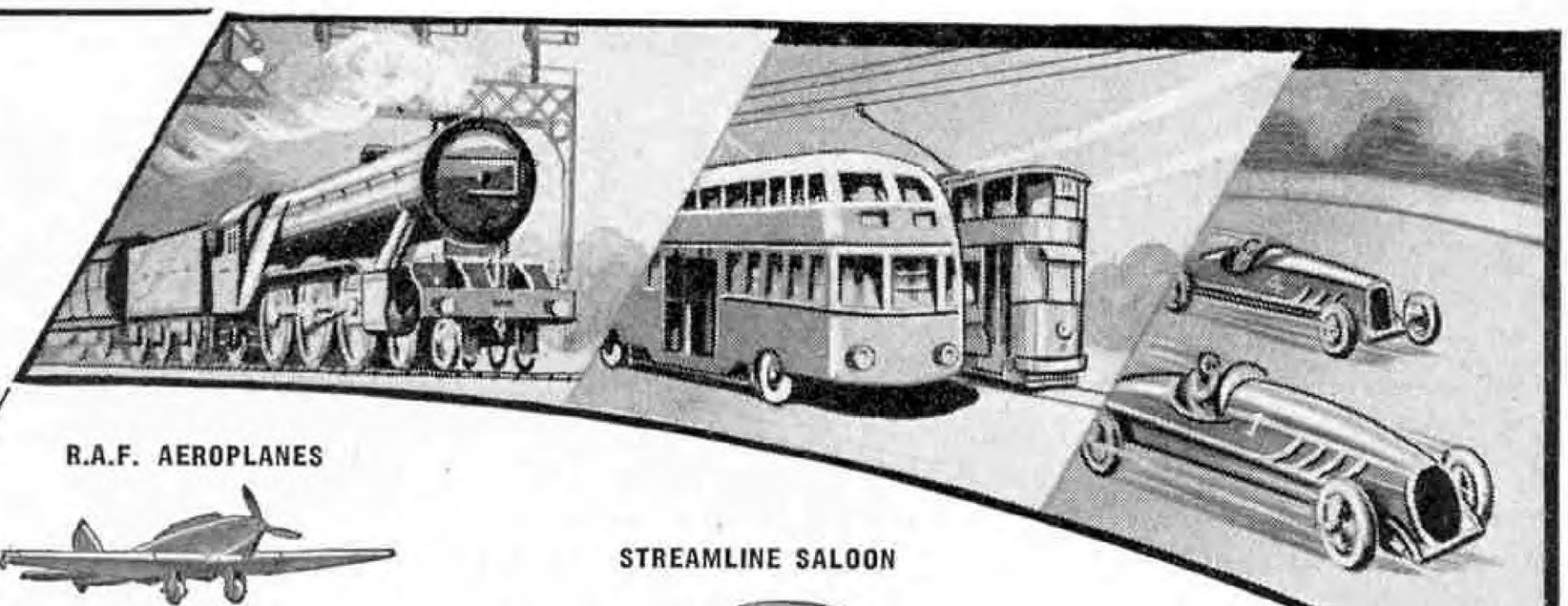
nobbies is that of Dinky Toys collecting. These eir rich colouring and perfection of finish. en made to the series, and in the splendid tha 300 models, there are items that will

e specially useful for adding finishing uts, while others, such as the Traffic cles, and Petrol Pumps, are ideal for road scenes. There are also reproduc- liners, including Britain's wonder ' and famous ships of the British be used with realistic effect in

be had in playing with these e table or on the floor, and such as the Sports Cars can be devised. id girl should start this ing hobby to-day. All purchased separately, be obtained in com-

our Meccano and ealer for a price ng details of plete range of Toys.

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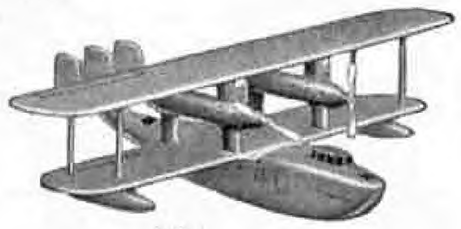
R.A.F. AEROPLANES



60n



60p



60h

Dinky Toys No. 61

No. 60h "Singapore" Flying Boat	each	**1/-**
No. 60n Fairey "Battle" Bomber (2)	"	**4½d.**
No. 60p Gloster "Gladiator" Biplane (2) ...	"	**6d.**

Price of complete set **2/9**

MEDIUM BOMBER

Dinky Toys No. 60s

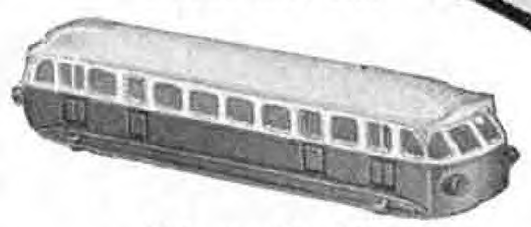
Similar to Fairey "Battle" Bomber (No. 60n), but with new Air Ministry Shadow Shading. Price **6d.** each

STREAMLINE SALOON



Dinky Toys No. 22h
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each

DIESEL RAIL CAR



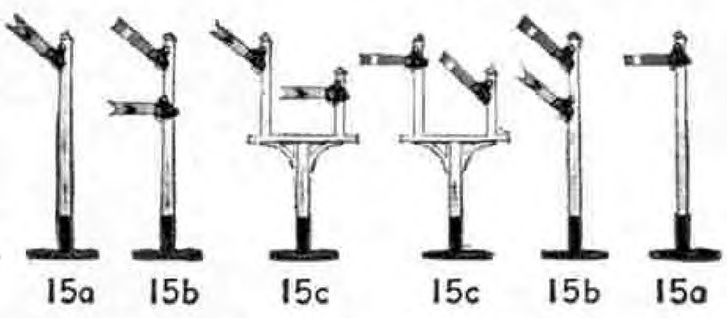
Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each
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MOTOR TRUCK



Dinky Toys No. 22c
Assorted colours.
Fitted with detachable rubber tyres.
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RAILWAY SIGNALS

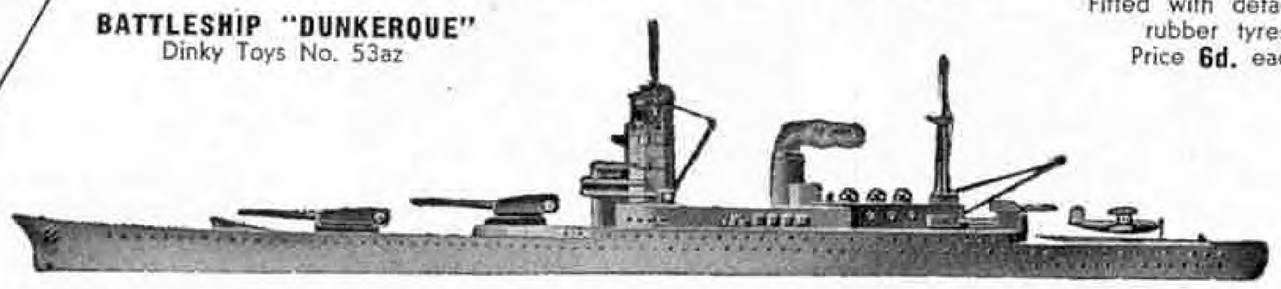


Dinky Toys No. 15

No. 15a Single Arm Signals ("Home" and "Distant")	each	**2d.**
No. 15b Double Arm Signals (two in set)	"	**3d.**
No. 15c Junction Signals ("Home" and "Distant") ...	"	**4d.**

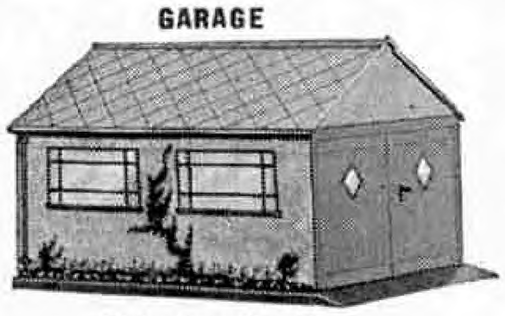
Price of complete set **1/6**

BATTLESHIP "DUNKERQUE"
Dinky Toys No. 53az



Scale model of the French 26,500 ton Battleship *"Dunkerque,"* which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
(Made in the Meccano Factory in Paris)

GARAGE



Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars.
Price **1/3** each



151a

ROYAL TANK CORPS MEDIUM TANK SET



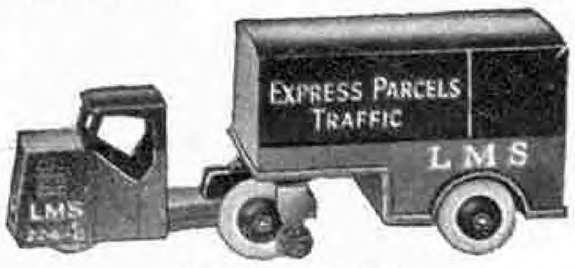
151d 150d 151c 151b

Dinky Toys No. 151

No. 151a Medium Tank (12 tons, 90 h.p.)	each	**1'6**
No. 151b Three-ton Transport Wagon	"	**1'1**
No. 151c Cooker Trailer with jack stand	each	**7d.**
No. 151d Water Tank Trailer ...	"	**6d.**
No. 150d Driver	"	**3d.**

Price of complete set **3'11**

RAILWAY MECHANICAL HORSE AND TRAILER VAN



Dinky Toys No. 33R
Fitted with detachable rubber tyres.

No. 33Ra Railway Mechanical Horse	each	**8d.**
No. 33Rd Trailer Van	"	**10d.**

Price, complete, L.M.S.R., L.N.E.R., G.W.R. or S.R. ... **1/6**

SIX WHEELED WAGON



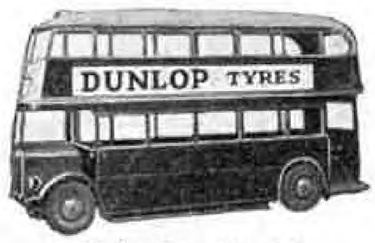
Dinky Toys No. 25s
An interesting model of a modern three-ton wagon. In assorted colours.
Price **1/-** each

TAXI WITH DRIVER



Dinky Toys No. 36g
Fitted with detachable rubber tyres.
Price **11d.** each.

DOUBLE DECKER BUS



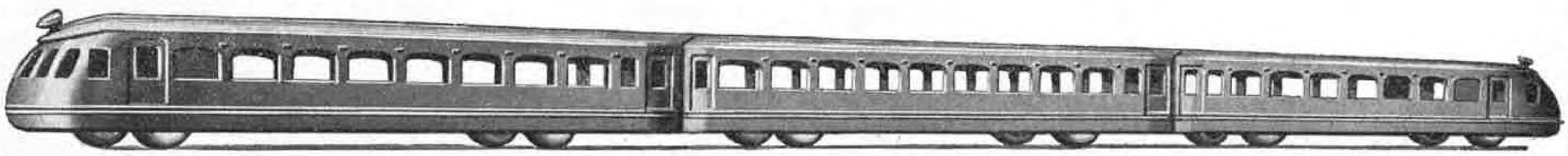
Dinky Toys No. 29c
Assorted colours. Fitted with detachable rubber tyres.
Price **1/-** each

E-WHEELED IVERY VAN



Toys No. 14z
ith opening lid.
10d. each
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in Paris)

STREAMLINE DIESEL ARTICULATED TRAIN



Dinky Toys No. 16z Price **1/6** each
(Made in the Meccano Factory in Paris)

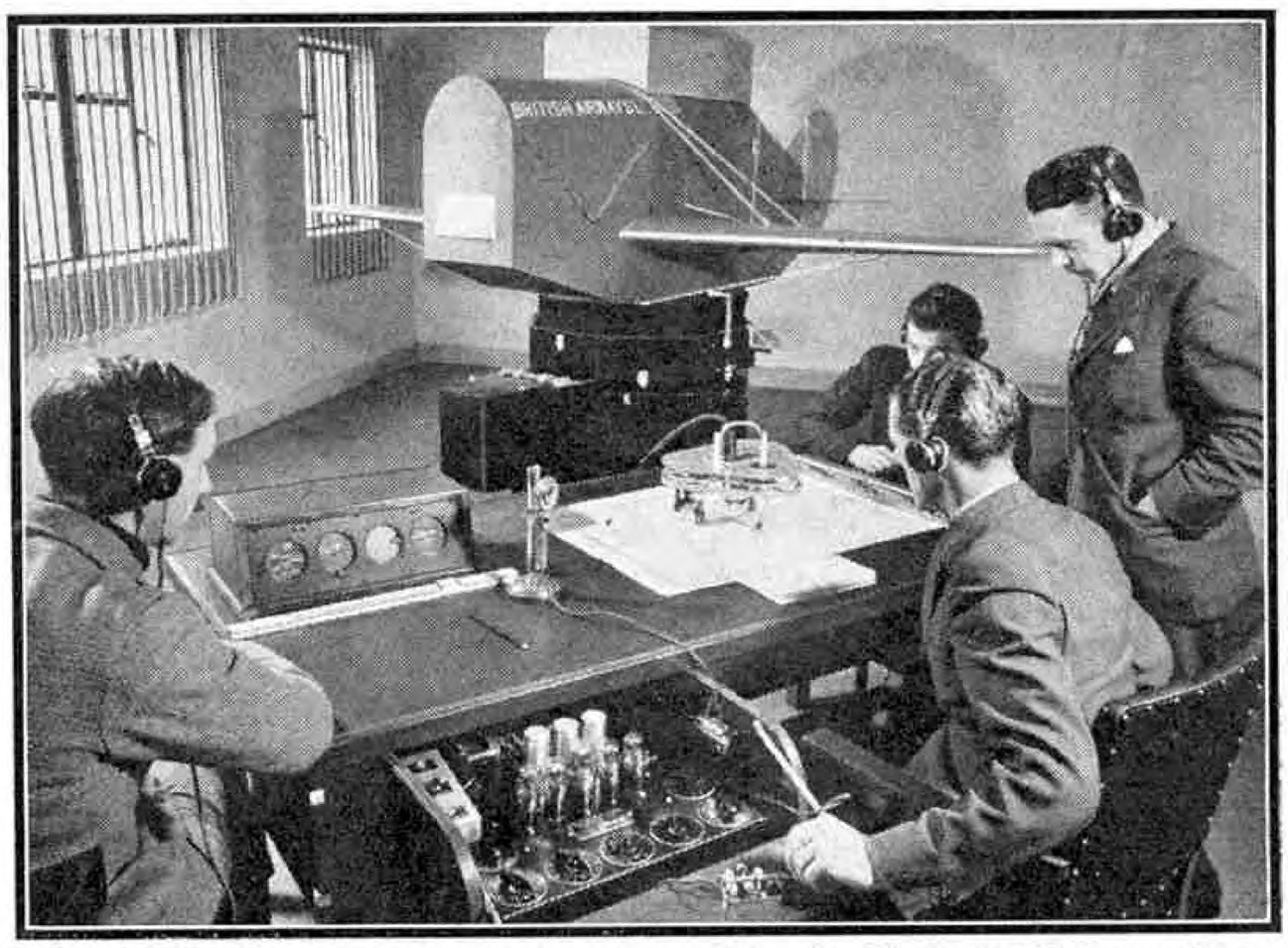
D., LIVERPOOL 13

Learning Blind Flying on the Ground

The Link Aviation Trainer

PILOTS of aeroplanes, whether military or civil, cannot always rely upon fine weather and good visibility, and there are many occasions when fog, darkness or other bad conditions make blind flying necessary. The usual method of training an airman in flying of this kind is to cover his cockpit with a hood so that his instruments alone are visible to him. This method has the great disadvantages that it requires the pilot and his instructor to fly together for many hours before the former becomes really proficient, and is expensive.

Recently an entirely new method of teaching blind flying has been developed in America. This makes use of the Link Aviation Trainer, a device by means of which the instruction is given on the ground instead of in the air. It is claimed that not only is it the best method of instruction, but that with it the cost of training is reduced by at least half. From 20 to 30 hours training in the air is required by the average pilot who wishes to become a skilled blind flyer, but he would become proficient after 10 to 15 hours in the Trainer, followed by only five hours in the air. The device has been produced by Link Aviation Devices, Inc., Binghamton, New York. It has already been widely adopted in the United States, where it is being used by the Army Air Corps, and is employed as standard training equipment by air transport companies and flying schools. It has now been introduced into Great Britain; in fact is now more intensively used in the R.A.F. than anywhere else in the world. A machine that has been installed in the pilot's training school of British Airways at Gatwick is shown in the illustrations to this article.



A class at British Airways' training school watching a pilot, enclosed in the Link Trainer, making a "blind approach" to an aerodrome by radio. They do this by watching the "crab," or automatic recorder, moving over the map on the table. They are also able to listen to the radio signals he is receiving, and thus to interpret the correctness or otherwise of his reactions. The illustrations to this article are reproduced by courtesy of British Airways Ltd.

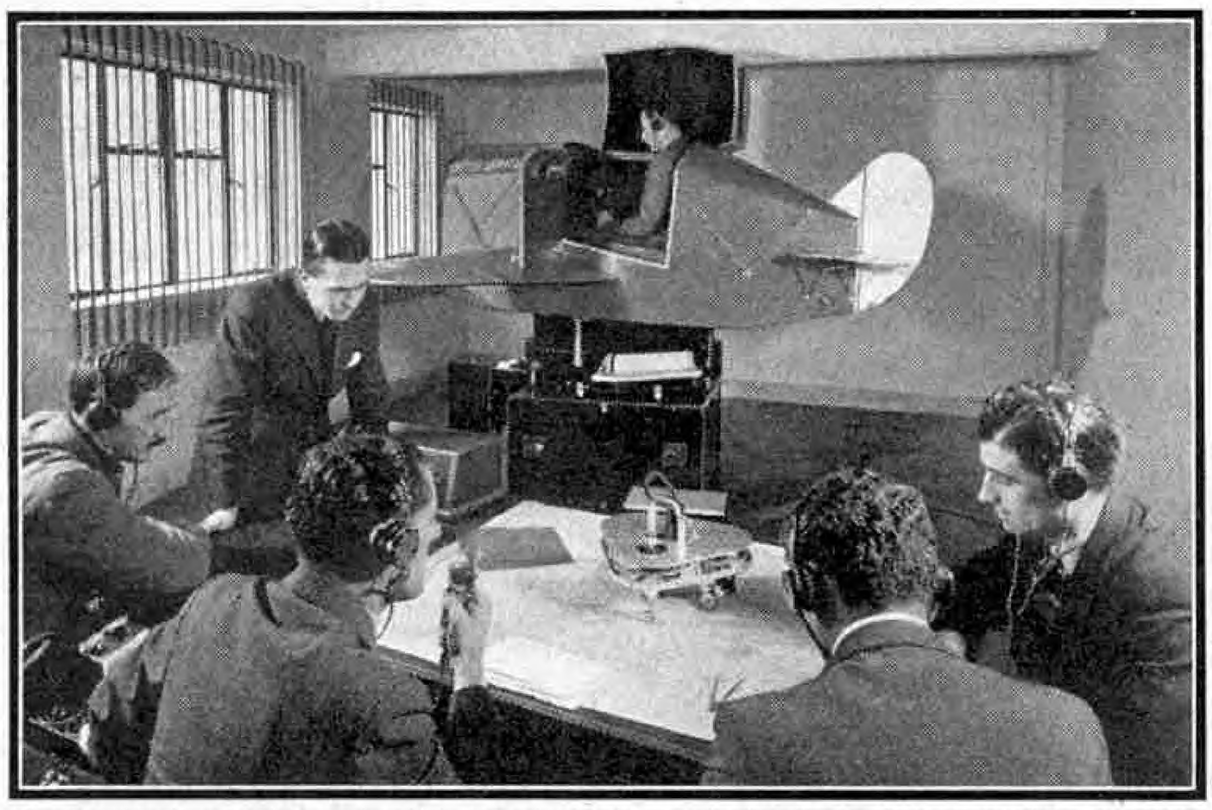
The Trainer resembles a small hooded aeroplane, complete with fuselage, wings, ailerons and tail section, but without engine and undercarriage. In the cockpit there are the usual control column and rudder bar, together with a full range of instruments for blind flying, including a compass, an airspeed indicator and an altimeter. The aeroplane responds to every movement of the controls in exactly the same manner as a real aeroplane does in flight, and the instruments indicate the resulting changes of course and position. These indications of course are not real. For instance, after a long climb the altimeter will show that a certain height, perhaps of several thousand feet, has been attained, whereas in reality the aeroplane is still at the same height as when it started. The indications are exactly those that would follow similar movements in a real aeroplane in flight, however, and thus the pupil can be instructed in straight flights, climbing, turning and every other manœuvre of which the aeroplane is capable.

In ordinary blind flying instruction the instructor sits in the cockpit of the machine with his pupil. When the Link Trainer is in use he sits at a table in the room in which the device is installed, and gives instructions to his pupil by radio telephone. He is kept in complete touch with the progress of the flight on which the pilot in the cockpit is supposed to be engaged by means of a map spread out on his table, over which there crawls a wonderful recording instrument to which the expressive name of "crab" is given. This consists of a small three-wheeled trolley driven by a special type of motor that is connected electrically with the Trainer by means of a flexible cable. It is driven across the map at a speed corresponding to that at which the flight is supposed to be taking place, at the same time reproducing the direction of flight and any changes that are made. One of the wheels indicates the course followed by making an ink line on the map, or on a sheet of tracing paper placed over it, and at the end of the practice flight the pilot can see for himself what course he has followed.

The mechanism of the Trainer is simple but remarkably ingenious. The fuselage is pivoted well clear of the ground on a universal joint, which in turn is mounted on a table that can be turned completely round. Between the fuselage and the table are a series of bellows, which have their upper faces fixed to the fuselage and their lower ones to the turntable. These bellows can be connected through special valves to a vacuum turbine driven by a $\frac{3}{4}$-h.p. electric motor, and air is pumped out of them as required in order to give the necessary movements. For instance, there are bellows under the front and rear of the Trainer respectively. The handle of the valve controlling these is connected to the control column in such a manner that pulling the latter backward places the rear bellows in communication with the pump. Air then is sucked out of these and the rear of the fuselage sinks, giving a climbing attitude. Pushing the control column forward has exactly the opposite effect, for air is then sucked out of the front bellows, so that the Trainer begins a dive. A similar pair of bellows on the right and left are used to simulate banking.

Turning is effected by means of two double vacuum

motors, with 10 small bellows to each unit, and the mechanism in this case includes an arrangement of cranks, pulleys and belts. Manœuvres of every kind open to a real aeroplane can be reproduced exactly by combinations of these movements, which are brought into play by means of the control column, rudder bar and throttle, just as in real flight.



A pilot about to start on a cross-country flight. He is receiving final instructions and the latest weather report by radio telephone from the instructor.

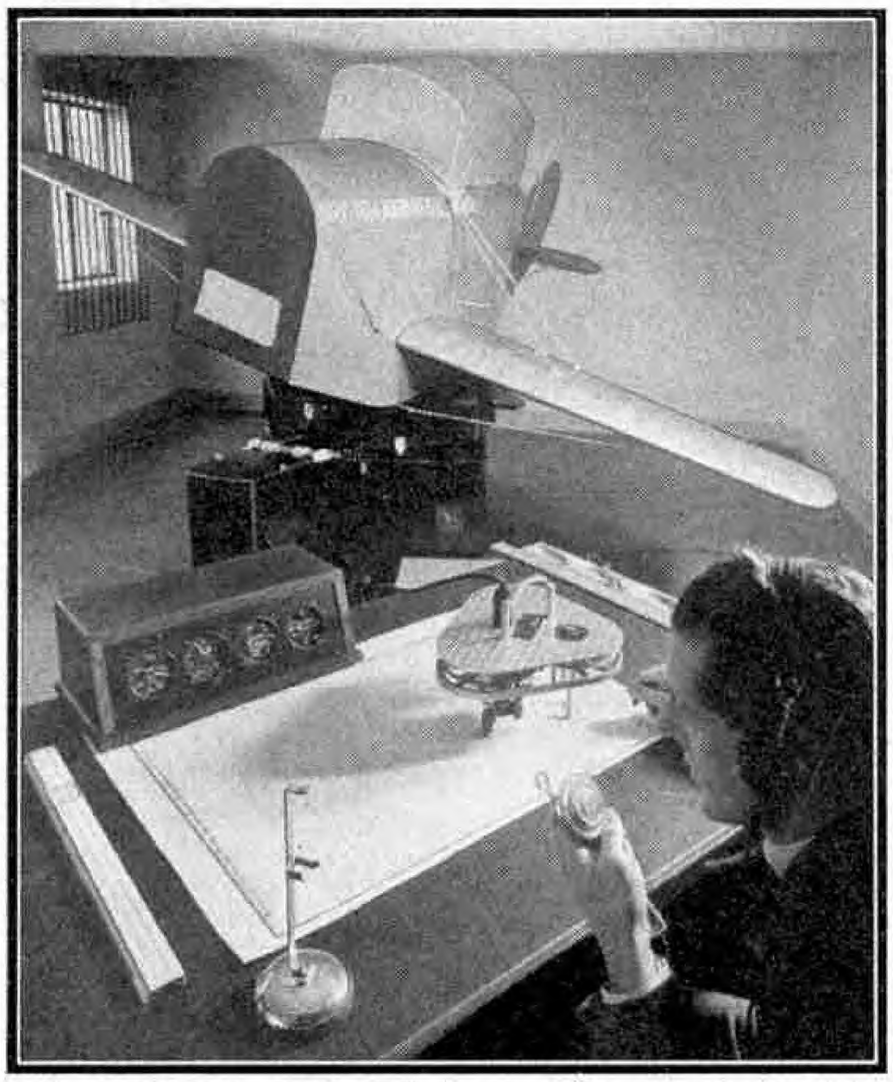
The pupil in the Link Trainer must first learn to fly his machine straight and level. This requires concentration, for the Trainer has purposely been made very sensitive and light in operation. The greatest fault in flying by instrument is over control, but this is checked at the very beginning of training by the lightness of the controls and by the fact that the machine is purposely made highly unstable. Thus close attention has to be given to every movement in order to acquire the necessary delicate touch.

Once a pupil has learned to fly the Trainer correctly, he is then instructed to make slow turns, and this is followed by the execution of fast turns and finally spins. Actual flying conditions can be simulated very closely, and in this respect the use of the Trainer has a great advantage over the hooded cockpit method of training in actual flight. When blind flying is taught in the air, the flights usually are carried out in good conditions, so that the pupil does not learn how his instruments are affected when air conditions are rough. The instructor using the Link Trainer can introduce very realistic "bumps," for an automatic device is incorporated that shakes and buffets the dummy aeroplane in the same manner as a real aircraft flown in rough weather. This can be turned on or off at will by the instructor.

A particularly realistic feature is the manner in which actual conditions are imitated in spins. The speed at which these take place is about the same as in an actual aeroplane, and is sufficient to make the pilot dizzy unless he takes the necessary steps to control the movements of his "ground" plane. The Trainer goes into a spin automatically when speed is reduced to a setting determined beforehand, and which for example may be 60 miles per hour.

It is also possible to simulate "icing conditions," and at first the sudden introduction of these defeats the judgment of nearly all, including the most experienced.

Cross-country flights using regular airway maps can be worked out with the Link Trainer, and the exercises that can be set to pupils introduce such problems as the effects of cross winds, unexpected changes in weather requiring alterations in course, and other variations. The Trainer is particularly suitable for instruction and practice in long-distance navigation and cross-country flights of any kind, and with it a pupil's judgment and initiative can be completely tested and appraised without risk to his life.



Instrument flying on the Link Trainer. The instructor is telling a pilot that visibility at the terminal aerodrome is so bad that a "blind approach" is necessary.

So far nothing has been said in regard to the use of radio signals and radio beams, a highly important feature of blind flying. The Link Trainer is designed to give thorough instruction in this subject. Radio signals and telephony broadcasts are transmitted through headphones to the pilot from the instructor's desk, which houses equipment that can send to him the same signals and indications as are given by ground stations at aerodromes. The volume of these is controlled by the instructor, so that he can train his pupils to listen for them as if they were actually in the air and approaching the station sending them out.

The Link Trainers used by the R.A.F. and British Airways Ltd. have been modified to permit them to be used in giving training in the Lorenz radio blind landing system that is in operation at Croydon and other important airports in this country. Another variation from the standard Trainer is the provision on the instructor's table of a panel of instruments that reproduce exactly the readings of those in the cockpit.

With all this equipment, a pilot in the cockpit of the Trainer can be sent out on long and difficult flights in which he relies upon his instruments and lands in accordance with the Lorenz system, and he can do this without actually leaving the ground. To start a flight of this kind, the instructor places the crab or recorder, at some position on the map that is known to him, but not to the pilot. He then transmits to the cockpit the signal that would be received by the pilot if he were flying in a similar position in relation to a station transmitting a radio beam. The pilot has to interpret the signal and to find his position and perhaps even the beam itself, as the preliminary to flying along the latter to the station, and finally effecting a good landing.

The instructor follows his progress by the path traced on the chart by the crab, and sends him the same signals, with corresponding changes in volume and modulation, that the pilot would receive in actual flight. How the flight has been made is revealed by the line on the chart. The crab is an impartial recorder and judge.

For the information in this article we are indebted to J. V. W. Corporation Ltd., London.



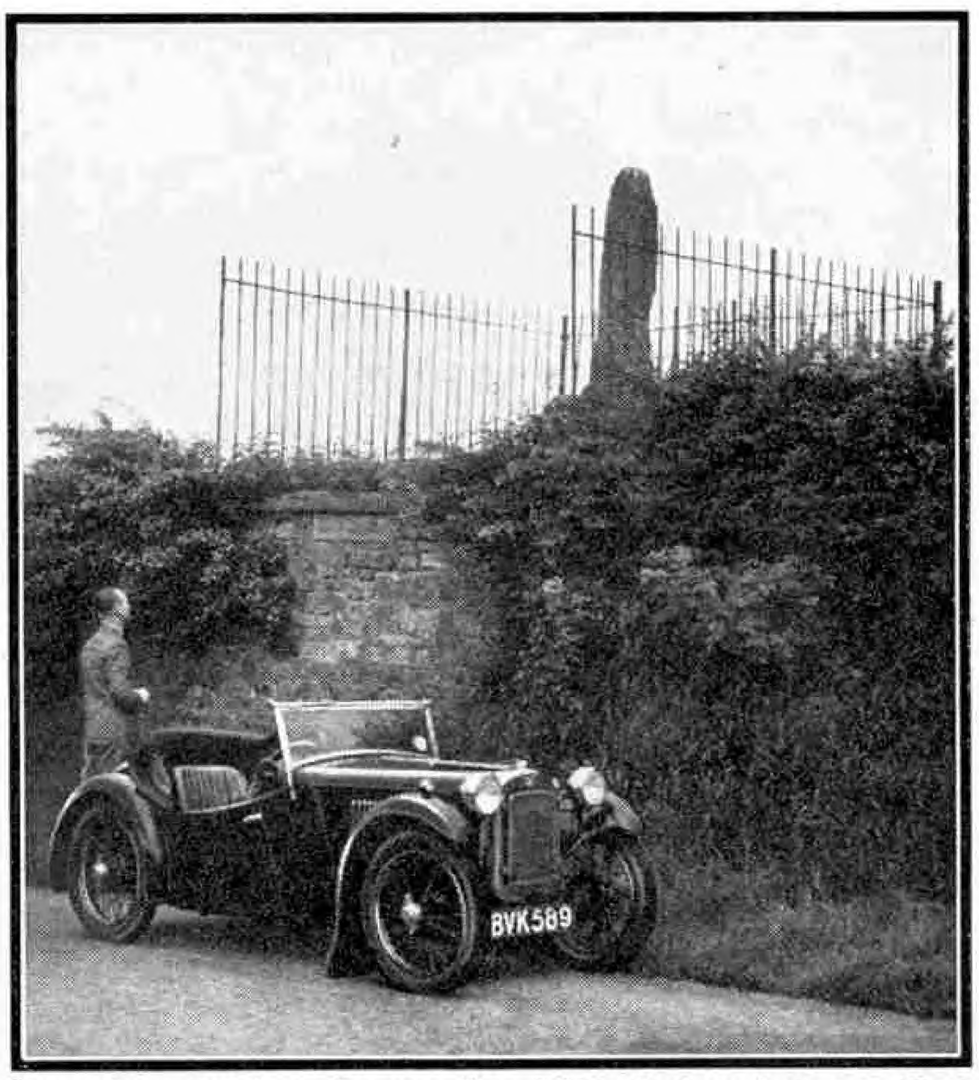
These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

A Strange Landmark

On the Great North Road, four miles north of Piercebridge, Durham, there is the strange stone illustrated on this page. This is a well-known landmark. It is in the form of a cross, and its origin has long been a puzzle. One suggestion is that it was a Roman milestone, probably the fifth from a famous Roman camp that was established at Piercebridge. There is Saxon knotwork on the east face of the upright column, and marks left by Roman tools are also to be seen.

The name of the stone is the curious one of "Legs Cross," which by some is said to be derived from the fact that King James I, who was bow-legged, once sat upon it when staying at Walworth Castle, a few miles away. Other authorities maintain that the name indicates that the cross was a "legg" or boundary mark, and that the stone served this purpose in the 8th century.

J. D. R. ROBINSON (Darlington).



The curious stone formation near Piercebridge, Durham, known as "Legs Cross." Photograph by J. D. R. Robinson, Darlington.

Sliding to Work in a Salt Mine

When in South Germany I went through the famous salt mine near Berchtesgaden, in Bavaria. On arrival at the mine with other visitors, we were led into a room and each was given a jacket and a pair of slacks, both of black cotton, and hard "pork pie" hat, lined for hygienic reasons with a clean paper serviette. We put these on, and were greatly puzzled when stout leather aprons were then tied on us, not in front, but behind.

Our unusual appearance when completely arrayed caused us great amusement as we waited at the massive stone entrance of the mine. What is best described as an upholstered form on wheels soon came along a narrow gauge track. On this, sitting astride and clinging to each other for support, we passed slowly up a narrow tunnel bored into the hillside that led to the workings, thus having the unusual experience of climbing upward, instead of descending, as is the usual practice when entering a mine.

We passed a large illuminated sign bearing the words "Glück Auf," that is "Good Luck," the miner's wish for a safe return to the surface, and after a journey of about a mile we dismounted in a vast underground cavern lighted by powerful electric lamps. In the centre was a display of lantern slides illustrating the history and methods of salt mining. With the aid of these the guide outlined the story of the mine from the earliest times right up to the present day.

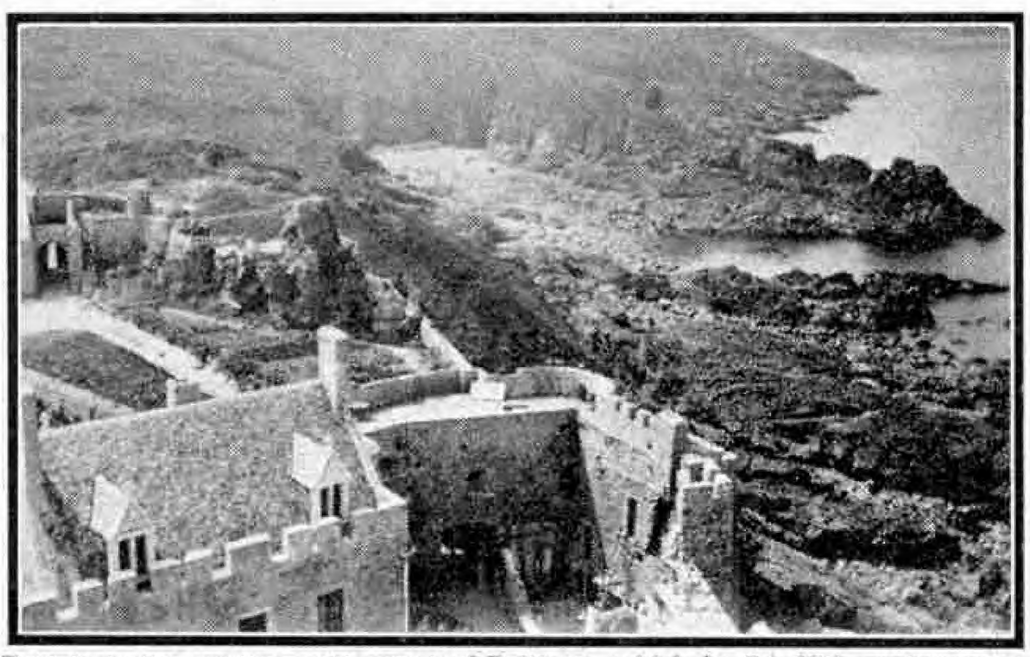
Next we were led to an opening from which a wooden trough led down a steep incline. The trough was broad, rounded and polished, and following our guide's example we sat down on it and slid helter-skelter fashion into the dimly-lit depths. It was then that we realised the necessity for our strong leather aprons and the unusual position in which we wore them. A gentle rise brought our thrilling descent to an end, and we jumped to our feet to hear the guide saying that we were in the Franz Joseph Chamber, a disused part of the mine. When our eyes had become accustomed to the gloom we were able to make out the old galleries in which miners worked with picks to remove the native salt.

After peering into the murky depths of a shaft that had been sunk in an endeavour to find fresh layers of salt, we ascended to a higher level in a very up-to-date electric lift. In this level no work was in progress, and the galleries through which we passed were airy and well lighted. At various points were collections of coloured rock salt of various shapes and sizes, all beautifully polished and engraved, some commemorating Royal visits to the mine and others the deaths of important persons. In many cases their transparency and colour, which ranged from a rich red-brown shade to a delicate mauve, were revealed by powerful electric lights placed behind them.

We then went down another "slide," and found ourselves on the edge of a vast lake, where our eyes were dazzled by hundreds of coloured lights, and their dancing reflections in the water. At the far end of the lake was another illuminated "Glück Auf" sign. We stepped into a large flat-bottomed boat, and as our guide sculled us through this wonderland, it was difficult to believe that we were inside a mountain. We returned to our mobile form through a low tunnel. R. K. FURNESS (Leeds).

A Canoe Trip along the Coast of Brittany

Last summer my friend, a French boy, and I enjoyed a trip along the coast of North Brittany in a home-made sailing canoe. We set out from Cancale, on the west side of the Bay of St. Michel, and after a day's sail westward made our first camp on the Dinard bank of the River Rance, where we had a magnificent view of St. Malo and St. Servan across the water. Next day we went on to Fort la Latte, which was used by privateers in the 17th century, and is shown in the upper illustration on this page.



Fort la Latte, on the north coast of Brittany, which in the 17th century was occupied by privateers. Photograph by M. F. Tilley, Bruton.

We sailed on, and a storm sprang up when we were off Cape Fréhel, a bluff headland about a mile long. From the top of the cliff the turbulent waters must have looked fine, but from our point of view the rocks and breakers were much less attractive, as we were having difficulty in holding our way. We came through without mishap, however, and named the canoe "*Fréhel*" to commemorate our exciting half-hour.

A persistent westerly wind made progress difficult, so we turned about at the small fishing village of St. Antoine, just beyond the Ile de Brehat. Our first stop on the return trip was at Le Val André, a good day's sail away. Next day we were in Dinard again, and the day after back in Cancale.

We then decided to cross the Bay of St. Michel to Granville, 18 miles away, and this proved an exciting trip. The tide there is said to come in faster than a horse can gallop, causing a powerful current all round the bay, and the trip took us from eight o'clock in the morning until seven o'clock at night.

The sea was like a mirror when we started, and we paddled the first three or four miles. The weather forecast had promised us "strong southerly winds," however, and we eagerly awaited these. Imagine our consternation when a north wind suddenly sprang up! I wanted to go back, but my friend objected and after discussion we decided to continue. We hoisted the sail and made for the open sea, where for two hours we were out of sight of land, and had to steer a rough course by the Sun. After a time a speck of white appeared ahead on the horizon, and three hours later we were able to distinguish it as the Granville Lighthouse. We landed at Granville just after the tide had turned.

M. F. Tilley (Bruton).

Climbing a Ship's Mast

I read with interest K. L. Dutton's account of his tour of the "*Viking*" at Sharpness, which appeared in these pages last February. My friend and I also inspected the ship, and in addition had the thrilling experience of climbing one of her giant tubular steel masts. Three of these tower to a height of 170 ft., and the fourth is 50 ft. shorter.

We climbed one of the taller masts by means of the rigging seen in the lower illustration on this page, in which the ratlins are thin steel bars fastened at intervals across four steel cables. The first section was from the side of the ship to the top or head of the lower mast, about 50 ft. above the deck. There we pulled ourselves up by our arms through the "lubber's hole," as we were too inexperienced to follow the true sailor's way over the brim of the top.

We continued upward to the head of the next section, 50 ft. further up, where the lubber's hole was smaller and more difficult to get through. Yet another climb took us to the top of the third section, and there we had to climb over the edge. This was a nerve-racking experience, as in doing so we were leaning over at an angle of about 45 deg. The view was well worth the climb, however. We were about 150 ft. above the deck, and the people walking about immediately below us looked like midgets. In one direction we could see for miles down the River Severn, across endless sandy beaches, and on the other side we could see beyond the seemingly tiny Severn Bridge, over which a train appeared to creep slowly.

We then began our descent and this proved more difficult than the climb, for we could not see where we were going. Eventually I stepped on to the firm planking of the deck with a sense of relief, coupled with the happy feeling of having accomplished something that I may never again have the opportunity of doing.



Part of the rigging of the "Viking," showing the "lubber's hole" at the top of the lower mast. Photograph by W. F. Fry, Gloucester.

W. F. Fry (Gloucester).

An Historic Danish Castle

While staying in the coastal town of Elsinore, in Denmark, I paid a visit to King Hamlet's Castle. I entered the castle grounds through an impressive stone gateway with an iron portcullis, and went along a cobbled drive to the drawbridge. Crossing this I passed into the large cobbled courtyard, which is surrounded by the tall castle buildings. On the northern battlements I saw a number of cannons pointing out to the sea, which is only some 150 yds. away. The interior of the castle is furnished in 18th century style, and has some very interesting rooms, one large chamber being devoted to illustrating the progress of the Danish people.

I found the dungeons the most impressive feature of the Castle. They were reached by descending about 100 steps by the light of flickering oil lamps, and it was an eerie experience to walk along the stone passages lighted by smoky torches placed in iron brackets. Hanging from hooks on the wall were rusty chains and handcuffs, reminiscent of bygone days, and as I passed along the musty corridors, with shadows gliding across the walls, I could almost imagine the famous ghost of Shakespeare's "*Hamlet*" treading the corridors. R. A. Woolf (London).

In Search of New Models

Fine Subjects from Farm and Dairy

DURING recent years farm work has become more and more mechanised. Many interesting power-driven machines have been introduced to do the work formerly done by manual labour, and most of them form excellent subjects for Meccano models, for they cover a wide variety of types and provide something for owners of Outfits of all sizes. It is not difficult to get sufficient detail to enable good models to be built, for those who do not live in the country can usually find opportunities of seeing them at work, or can examine photographs in the "*M.M.*" or elsewhere. A ramble in the country during summer and especially at harvest time will provide many examples of machines to reproduce.

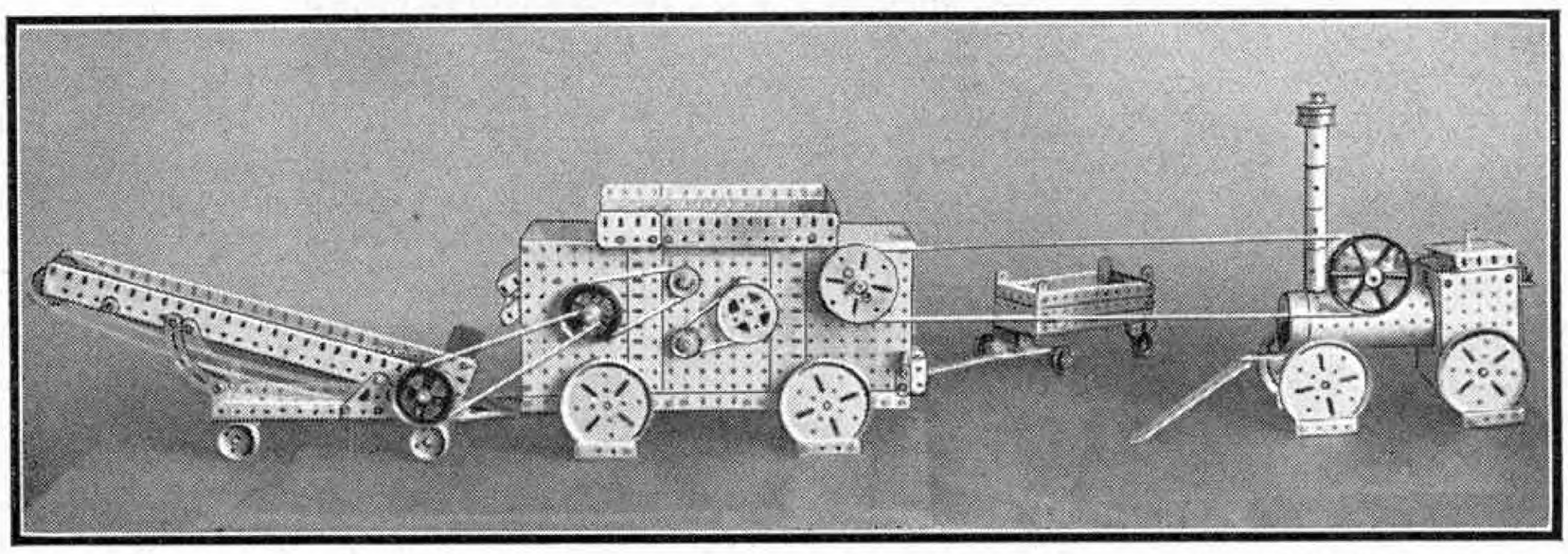


Fig. 1. A group of model agricultural machines, comprising a threshing machine and conveyor driven by a traction engine. The models were built by Waldo Vecchini, Ancona, Italy.

The various kinds of cultivators and rollers are splendid subjects for owners of small Outfits. One popular cultivator has a row of large curved teeth, which are fixed to a shaft mounted between the wheels, and is hauled either by a horse or a tractor so that the teeth dig into the soil and loosen the surface. In a model of a machine of this kind the teeth can be represented by Curved Strips mounted on a shaft. They must be capable of being raised above ground level, and a lever placed near to the operator's seat is incorporated for this purpose. The mechanism operated by it is very simple, and no model-builder will have any difficulty in designing it.

Harrows of various kinds also make good simple models. One type that is very interesting to reproduce has 16 or so conical steel discs, each of about 12″ diam., at equal distances apart on a shaft that is mounted in a wheeled chassis. The chassis is fitted either with shafts for a horse, or a coupling for connection to a tractor. Sometimes there are two rows of discs, arranged in tandem, the purpose of the second row being to cut and pulverise the clods and lumps of soil turned up by the front row. The Meccano Wheel Discs resemble the conical discs of a harrow, and can be used to advantage in making a model of such a machine. In a small model Bush Wheels or 1″ Pulleys can be used in place of the Wheel Discs.

A more modern and complicated cultivating machine is the gyrotiller, which is used on farms in many parts of the world. This is a power cultivator that has two vertical shafts, each fitted with a number of curved blades and driven by the motor. As the shafts revolve the soil is broken up and thoroughly mixed by the blades. The depth to which the blades dig into the soil is controlled by a lever from the cab.

A good model of the machine was illustrated on page 111 of the "*M.M.*" for February 1937. In that model the blades are represented by Double Angle Strips, and they are driven by an Electric Motor concealed in a casing built to represent a petrol engine. Universal Couplings are used in the transmission shafts to give the necessary flexibility to permit the blades to be raised or lowered as required.

Modern farm machines and implements often are hauled by powerful tractors. These tractors are made in many different types, and most of them are quite easy to reproduce in Meccano. Some idea of the pleasing results that can be obtained with a subject of this kind can be gained from Fig. 4. The model illustrated is operated by a No. 1 Clockwork Motor housed under the bonnet. Its front wheels are built up of two 3″ Pulley Wheels fitted with Rubber Rings, and placed face to face, a method that gives wheels with a suitable width of tread.

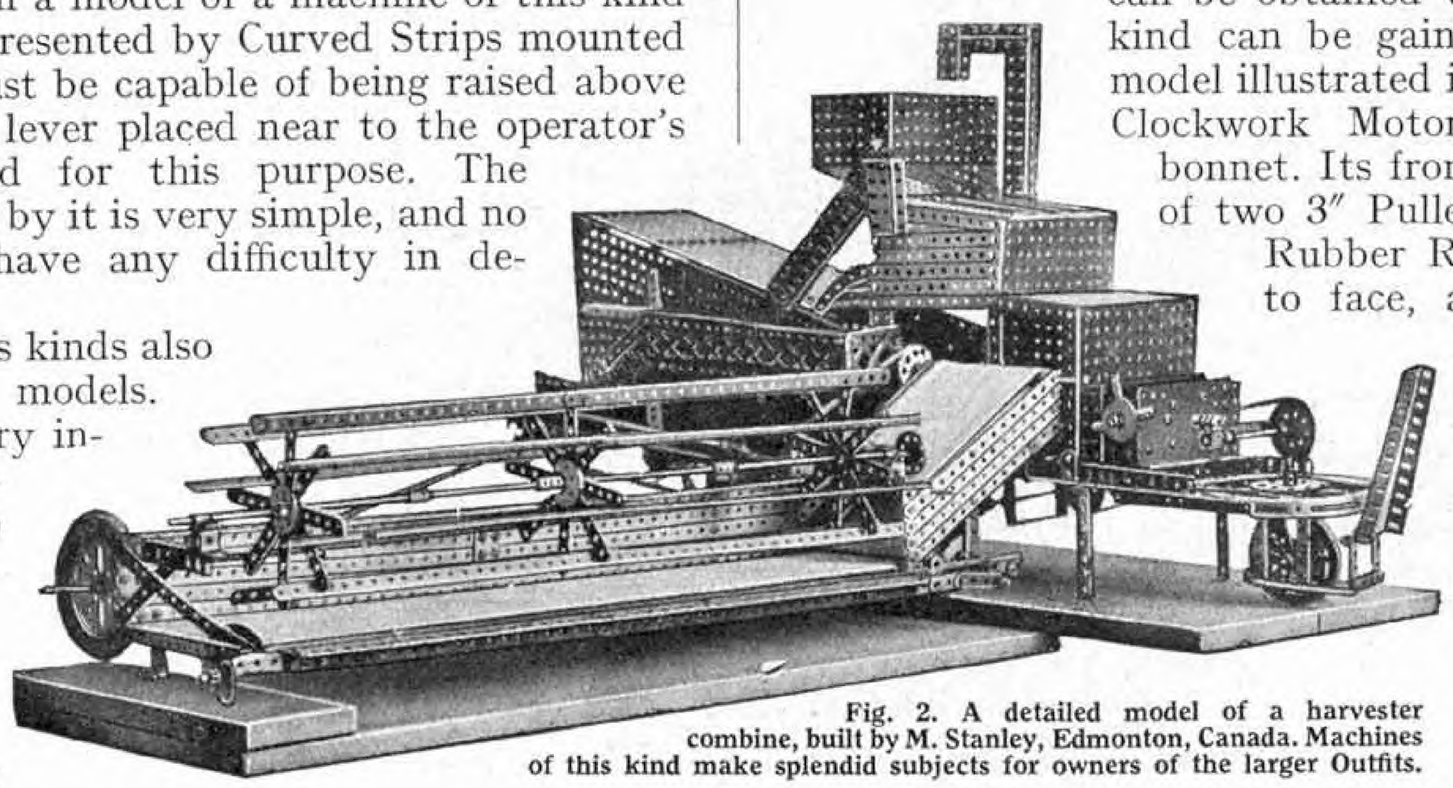


Fig. 2. A detailed model of a harvester combine, built by M. Stanley, Edmonton, Canada. Machines of this kind make splendid subjects for owners of the larger Outfits.

An interesting example of a tractor built with a small Outfit was illustrated on page 422 of the "*M.M.*" for July 1937. This model is driven by a *Magic* Motor, and is fitted with a bonnet made from Flexible Plates curved to shape.

At harvest time machines of a very different kind are brought into use. These include reaping and binding machines, swath turners, and on the larger farms harvester combines. The reaper is familiar to most model-builders, and it forms a particularly good subject for a model on account of the novel nature of its operating mechanism. The corn is forced against a reciprocating knife blade by rotating arms that are operated from the main axle by

chain drive, and as it is cut it falls on to a travelling conveyor placed behind the knife. The conveyor carries the corn to one side of the machine, where it is bound up into sheaves and then thrown out.

In a model the cutter can be realistically represented by a Rack Strip and the necessary reciprocating motion can be given to it by means of an Eccentric, or by a Bush Wheel and a connecting Rod. If the model is a very small one the binding mechanism cannot be reproduced in detail, but in a larger model there is plenty of scope for interesting experiment in designing a suitable knotter.

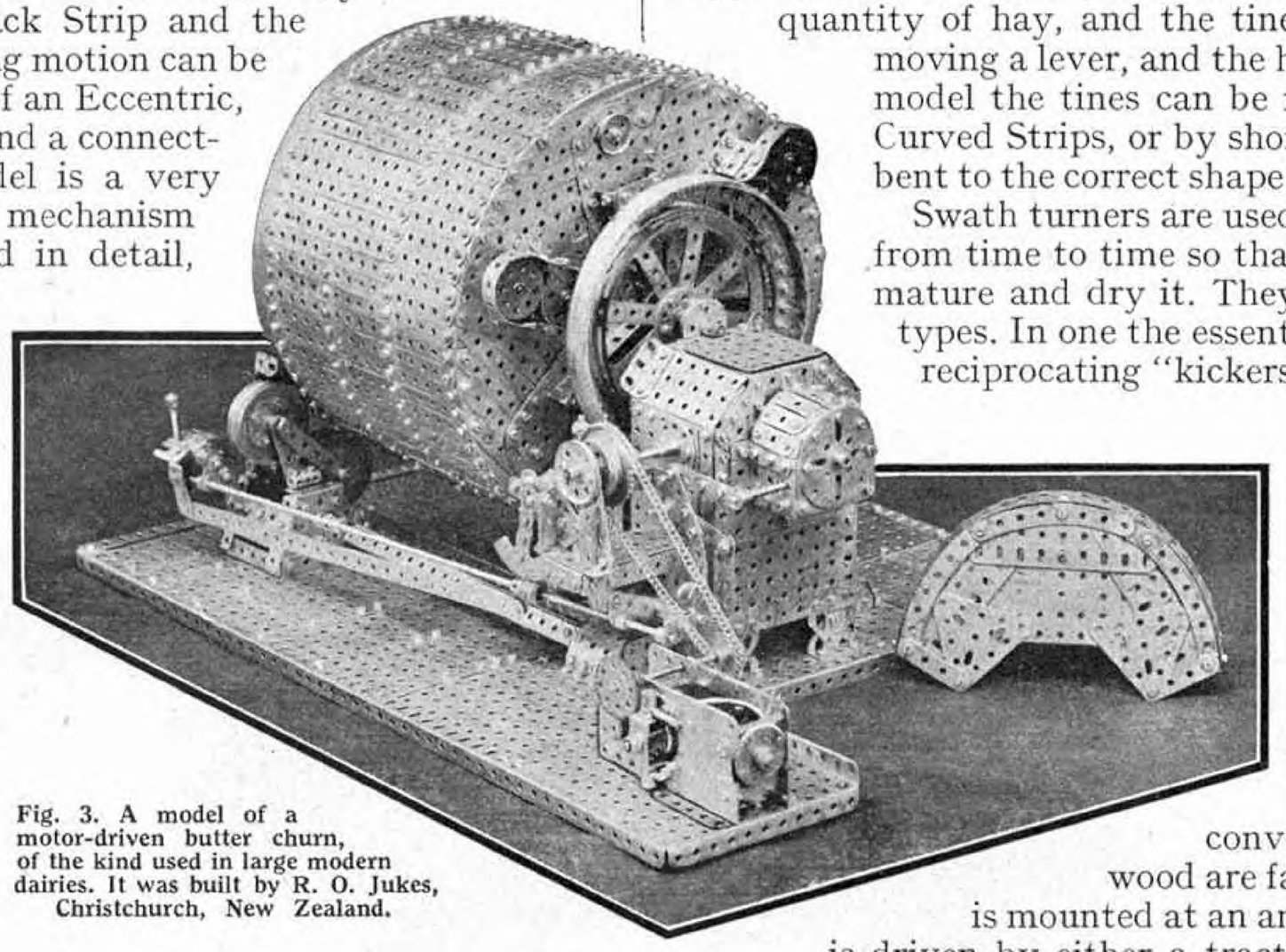


Fig. 3. A model of a motor-driven butter churn, of the kind used in large modern dairies. It was built by R. O. Jukes, Christchurch, New Zealand.

Another familiar harvesting machine that makes a splendid subject for a working model is the thresher. This is used for separating the grain from the chaff, and there are several different types from which to choose. A good example of a model thresher is shown in Fig 1. The various conveyor belts required can be represented by strips of stout paper or cloth, and there is nothing difficult in the construction of the mechanism. Both Clockwork and Electric Motors are suitable for driving a model of this kind, and if the model is a large one it is a good plan to omit one side of the casing, or to make it removable, so that the machinery can be seen in operation.

Hay-making machinery also provides the model-builder with attractive subjects, among which are the mower, the swath turner and the hay rake. There is nothing difficult in the construction of these machines in Meccano, and the completed models are most interesting to watch in action. The mower works in a similar manner to the reaping machine, except that there are no rotating arms and, of course, no conveyor or binding mechanism. The cutter arm is hinged at its point of attachment to the machine, and at its outer end a pointed divider is fitted to separate the cut from the uncut grass.

The knife of a reaper can be represented by an ordinary Strip or a Rack Strip, and the cutter arm should be connected to a lever at the side of the operator's seat, so that it can be raised to pass over stones and other obstacles.

The next stage in the modelling of agricultural machinery may well be the reproduction of a harvester combine, now so largely used in Canada, which cuts and threshes the corn. There are combines at work in this country, and the illustration on the opposite page of a Canadian example shows that these modern machines provide splendid opportunities for the keen and ingenious model-builder.

A hay rake consists of a wheeled framework carrying a shaft fitted with a row of curved prongs or "tines." The rake is drawn across the field until it has gathered a quantity of hay, and the tines are then raised by moving a lever, and the hay is left behind. In a model the tines can be represented either by Curved Strips, or by short lengths of stiff wire bent to the correct shape and fastened to Rods.

Swath turners are used to turn the hay over from time to time so that the Sun and air can mature and dry it. They are made in several types. In one the essential feature is a pair of reciprocating "kickers," which toss the hay over as the machine is drawn across the field.

Hay stackers are now used extensively on the farms, and there are two types in general use. One of these consists of a long framework, fitted with a belt type conveyor to which slats of wood are fastened. The conveyor is mounted at an angle to the ground and is driven by either a tractor or a horse. In the latter case, the horse walks in a circle and rotates a vertical shaft to which it is hitched by a connecting bar and harness. The drive from the shaft to the stacker is transmitted by a flexible shaft, and the framework of the stacker is jointed at the middle so that it can be folded up when not in use.

Model-builders should have little difficulty in building a model of a machine of this type. The framework of the model can be built up from Angle Girders or Strips, and the conveyor from a strip of cloth to which Strips are bolted. A workable flexible transmission shaft is easily constructed from Rods coupled together by Universal Couplings or Flexible Coupling Units.

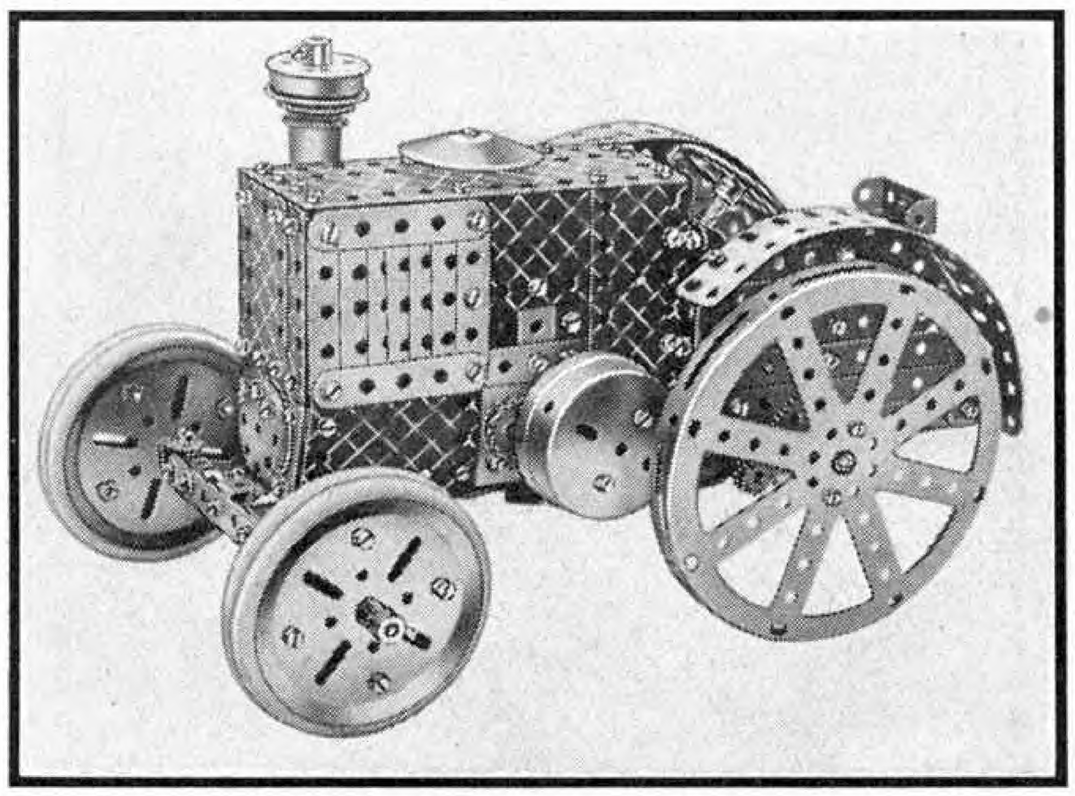


Fig. 4. This model represents one of the many types of oil-engined tractors used on farms for hauling ploughs and other agricultural implements.

In the second type of stacker the hay is lifted from the ground by teeth attached to vertical chains that run over wheels at the sides of the machine. In a model, this feature can be easily reproduced with a length of Meccano Sprocket Chain, fitted with short lengths of wire to represent the teeth.

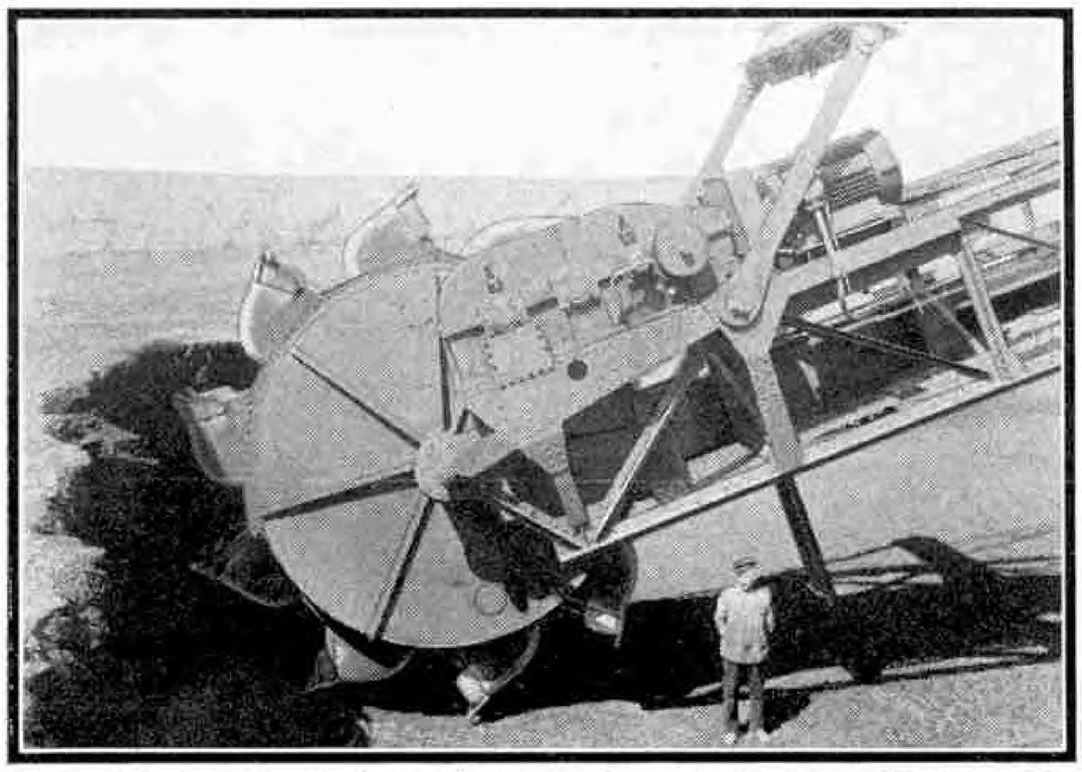
Other agricultural machines such as thistle-cutters also make interesting and novel subjects for models. An illustration of an actual thistle-cutter appeared on page 674 of the "*M.M.*" for November 1937, and a Meccano model of that machine is illustrated on page 289 of this issue.

A visit to a modern dairy farm will suggest many other novel subjects of exceptional interest. Among these are mechanical cream separators and motor-driven butter-making machines. A splendid Meccano model of one of the latter is shown in the upper illustration on this page.

Coal Scooped Out of the Earth

A Giant Bucket-Wheel Digging Machine

IN many parts of Germany and central Europe there are extensive deposits of brown coal or lignite. This mineral is inferior in heating value to the coal with which we are familiar, but it is largely used for firing industrial furnaces, and its extraction forms a very important industry in the districts where it is found. Usually brown coal is found very near the surface, and it is mined by digging it out after the overburden of earth, sand or clay has been removed. Typical brown coal fields occur in Rhineland, where there are seams over 300 ft. in thickness covered only by a shallow layer of sand. It is unnecessary therefore to sink a shaft, as in ordinary coal mining. Instead the coal is exposed by removing the sand by means of excavators of various types, and machines of this kind also are used to dig out the coal itself, which is comparatively soft and easily excavated. Operations of this kind are known as open pit mining.



The bucket-wheel of a giant excavator used in the open pit mining of brown coal in Germany. We are indebted to the Lübecker Maschinenbau-Gesellschaft, Lübeck, for the illustrations on this page.

The machines used are of various types ranging from ordinary mechanical shovels to drag-scrapers, according to the particular conditions in which they have to work. In some mines bucket chain machines are used. These can best be described as huge land dredgers, for the coal is scooped out by means of buckets fitted to an endless chain that travels along a massive steel boom. Excavators of this kind have attained a remarkable size, some examples having 40 or 50 buckets, each of 40 cu. ft. capacity, and being capable of digging from 1,300 to 1,500 cu. yds. of coal an hour.

Another type of machine that is now being extensively used in many of the brown coalfields is the bucket-wheel excavator. In this the excavating buckets are mounted on a wheel that revolves at the outer end of the jib. As the wheel rotates, the buckets scoop up the coal or overburden and deliver it to a belt conveyor, carried inside the framework of the jib, which transports it to a chute situated in the main frame. From there it passes to a second conveyor also carried by a delivery jib, by means of which it is loaded into wagons or railway trucks.

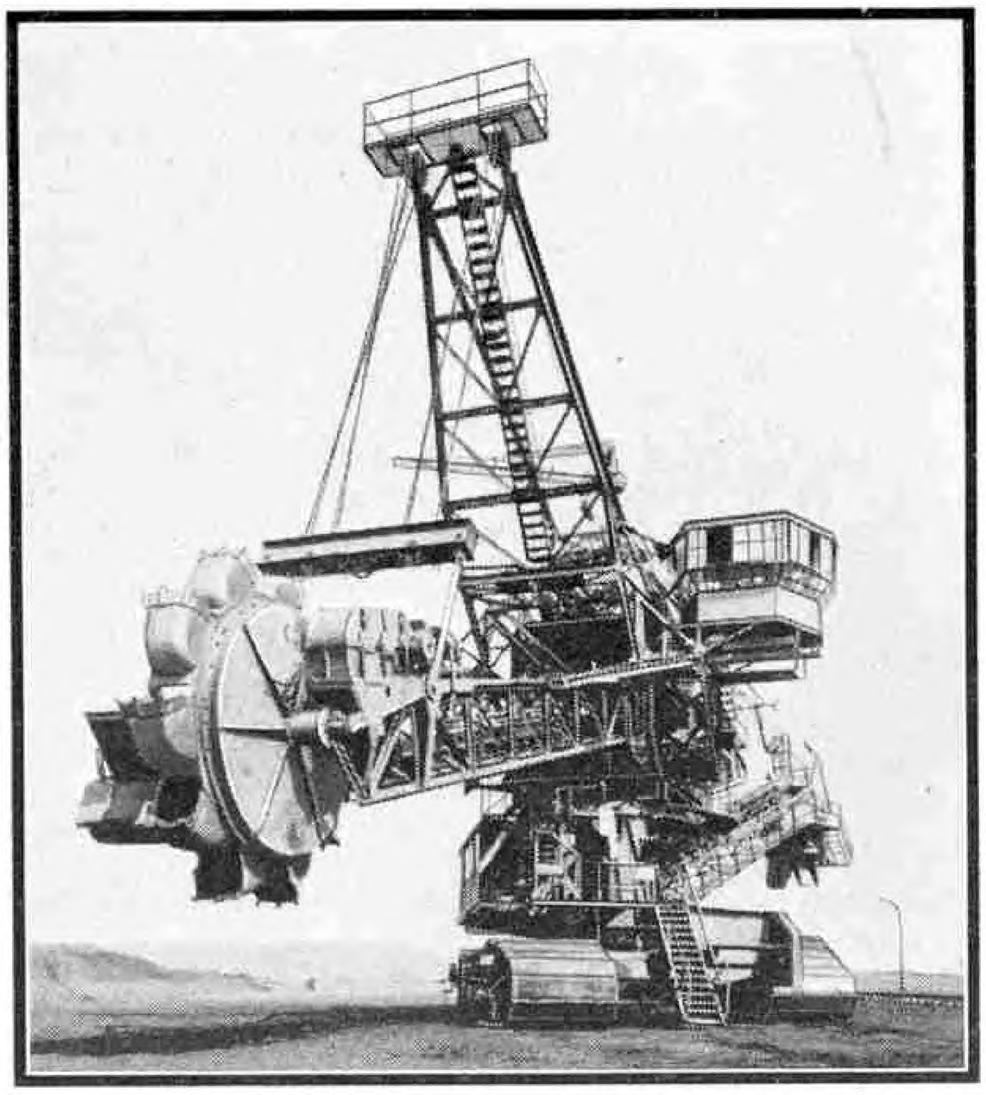
A large machine of this type constructed by the Lübecker Maschinenbau-Gesellschaft, Lübeck, Germany, is shown in the lower illustration on this page. It has a digging wheel more than 16 ft. in diameter, and this is fitted with 10 buckets, each of nearly 9 cu. ft. capacity. The complete wheel is shown in the upper illustration on this page, and some idea of its size is given by comparison with the figure of the workman standing near it.

The wheel of this machine is driven by an electric motor through a multi-disc clutch and a two-speed gear-box, and the buckets deliver the excavated material to a series of internal pockets, from which it falls on to a conveyor that travels inside a steel boom delivery jib, 54 ft. in length. The gear-box is controlled by a lever in the driver's cabin, and at the higher speed, which is suitable for use when the machine is excavating brown coal, the output is 980 cu. yds. per hour. The lower speed is employed when the machine is removing overburden, and gives an output of 706 cu. yds. per hour.

The jib carrying the digging wheel has a working radius of about 70 ft., and is supported by ropes that are taken to a winch situated on the main frame. Thus the jib can be set at any angle. It can also be telescoped inward towards the main frame over a distance of 9 ft. 10 in., so that the machine can be used for excavation from ground fairly near the place at which it is standing.

The upper portion of the main frame of the machine, together with the bucket-wheel jib and its supporting jib, can be turned round or slewed through a complete circle. The delivery jib can be slewed independently of the digging jib and superstructure through an angle of 140 deg., and its inclination also can be adjusted as desired. At its outer end is a hopper, with doors controlled by compressed air, so that the delivery to the wagons can be controlled.

The total weight of the machine is nearly 350 tons and it is carried on three creeper tracks driven by separate motors. Each is 18 ft. 10 in. in length and 7 ft. 6 in. wide, and there are two on one side and one on the other, so as to give a system of three point suspension.

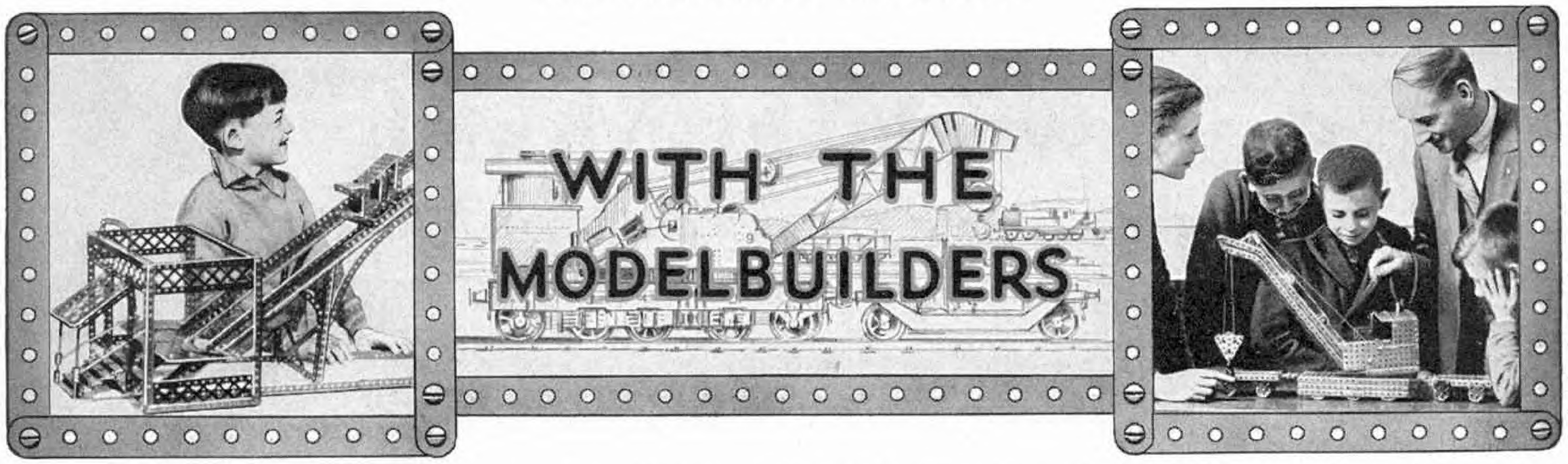


The complete bucket-wheel excavator showing the digging jib with the bucket-wheel at its end, and the control cabin. The machine weighs nearly 350 tons, and is carried on three creeper tracks.

There are 12 electric motors on the machine, and they are interconnected by relay mechanism in such a manner that they can only be started up in the correct sequence. The motor driving the conveyor on the delivery jib is first started, and this is followed by that of the conveyor of the digging jib. The motor driving the bucket wheel is next brought into action, and the slewing and traversing motors in turn are then started. If the machine has to be stopped for any reason during a normal digging operation, the traversing motion may not form part of the sequence, but even then the remaining motors can only be started in the regular order.

When the machine is in action the digging is controlled from a cabin placed near the inner end of the jib, and delivery of the brown coal dug out from a cabin in the lower part of the main frame. The normal method of working is to set the jib at the required angle and then to move it round to complete a cut along the curved coal face. The whole machine is then moved forward in readiness for a second cut of the same kind.

An excavator of this kind has the advantage that the buckets are in continuous operation, and no time is lost between the digging strokes as with an ordinary mechanical shovel.



GEARING FOR MECCANO CLOCKWORK MOTORS

Model-builders who do not possess many gear wheels will be interested in a scheme devised by J. Haldane, Chester, for obtaining from a No. 1 Clockwork Motor a powerful drive that necessitates the use of only one ½" Pinion. The Pinion is fixed to a Rod that forms an extension of the driven shaft of the model and passes through the side plates of the Motor in such a position that the ½" Pinion meshes with the main gear of the Motor, that is the one to which the spring is attached. The drive thus obtained is powerful enough to drive most of the models for which a Clockwork Motor is suitable.

A powerful slow speed drive can be obtained in a similar manner from the two larger Meccano Clockwork Motors. For example, a 1" Gear can be meshed with the main gear wheel of a No. 1a Motor, or a ¾" Pinion with the main gear wheel of a No. 2 Motor.

A scheme for obtaining a powerful drive without any gears whatever is put forward by H. Birchall, Skelmersdale, Lancs. In this system a Pulley on the shaft that is to be driven is connected by a Driving Band to the winding spindle of the Motor. In practice, however, the Driving Band tends to slip on the winding spindle, and this type of drive therefore can be recommended only as a makeshift when no gears of any kind are available. When the *Magic* Motor is used, a Pulley can be fitted on the winding spindle, however, and the drive can be taken from this by means of a Driving Band.

MECCANO MODEL DRIVEN BY TWISTED RUBBER BANDS

F. Marks, Southampton, recently sent me details of a very interesting racing car he has constructed. This is about 1 ft. in length, and its outstanding feature is that power for driving the car is provided by two rubber motors.

Each of the motors consists of six strands of thin rubber, which are anchored at one end to the frame of the car and at the other to a Coupling on the end of a Rod. The two Rods are geared to a central shaft, which in turn is connected by a train of gears to the rear axle. In order to prepare the car for a run, the gear train to the rear axle is first disconnected by releasing a clutch, and the motors are then wound up by turning a handwheel. Only a short time is required to do this, as a step-up gear is provided between the handwheel and the motor shafts. The clutch is then let in, the brakes are released, and the car runs forward. Marks informs me that his car runs for about one minute when the motors are wound up fully.

The chassis of the car is built up from Meccano parts, but the body is made from thin cardboard in order to keep the weight as low as possible.

Marks is at present working upon a mechanism for automatically switching on a new set of motors when the first set has run down. He intends to incorporate this in a new model powered by four motors. I hope his experiments will be successful and look forward to receiving further details of the mechanism in due course.

Rubber motors of course can be used in a large variety of models other than the type described above, and they provide plenty of scope for interesting experiment.

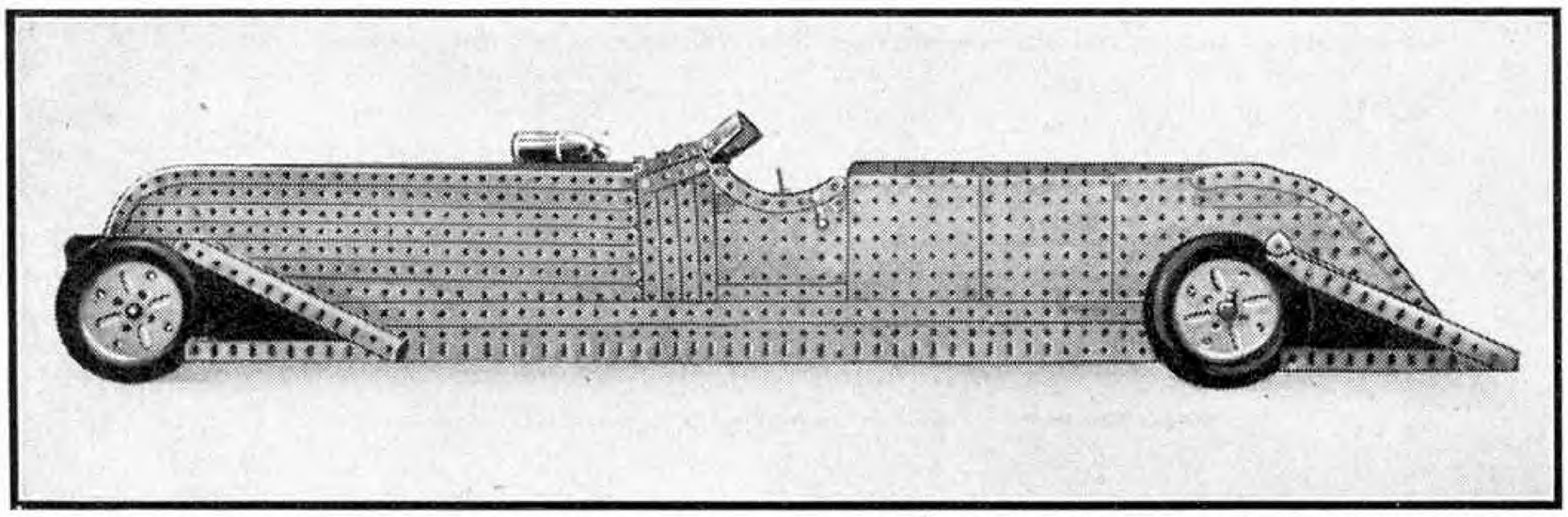
A SWISS ENTHUSIAST'S MODEL

The model car illustrated on this page was built by Marcel Girard, Corvelles St. Chavornay, Switzerland, who is a Meccano enthusiast. The model was based on a photograph of an actual racing car and illustrates the realistic manner in which subjects of this type can be reproduced with Meccano parts.

The model is equipped with a gear-box, differential, independent wheel springs and Ackermann steering. A celluloid windscreen is provided, and the wooden dashboard is equipped with separate switches for the head, side and tail lights, and push buttons for operating the motor starter and an electric horn. The horn is of the same type as that described in "*Suggestions Section*" of the September 1932 "*M.M.*," and is concealed inside the bonnet. The leads to the lamp-holders are taken from a Transformer housed in the rear part of the body.

ROLLER AND BALL BEARINGS FOR SMALL MODELS

In most models incorporating revolving superstructures, such as roundabouts and swivelling cranes, a roller bearing of some kind is required to allow rotation with as little friction as possible, for in even a small working model a large percentage of the power of the drive may be lost if proper bearings are not provided. Fortunately, however, efficient roller bearing units can easily be built up from standard Meccano parts. One of the most simple consists of a 1½" Flanged Wheel fastened on a Rod, with five Steel Balls inside the flange of the wheel and a Bush Wheel placed on the Rod so that its face rests upon the Steel Balls. If Steel Balls are not available, a very serviceable roller bearing can be constructed by fitting two 1½" Flanged Wheels on a Rod, and then placing four ½" loose Pulleys between their flanges.



A fine model racing car built by Marcel Girard, Corvelles St. Chavornay, Switzerland. Included among its many interesting fittings are an electric horn and an electric lighting system.

A NOVEL USE FOR MECCANO PARTS

Peter Wilson, North Harrow, recently sent me details of a Meccano attachment he has fitted to his mother's hand vacuum cleaner so that she can use it for cleaning carpets.

The cleaner consists of a cylinder containing an electric motor and a fan, to one end of which is attached the suction nozzle. A short wooden handle is fitted to the top of the cylinder. The first thing that Wilson did to effect the conversion was to fasten a strip of aluminium around the cylinder. The ends of the strip were bolted together underneath the cylinder to make a flange. To this flange a frame of Strips was secured to carry axles for two 2" Pulleys with Tyres, which serve as wheels. A broomstick was then fitted in place of the original short handle of the cleaner.

AN EFFECTIVE MAGNETIC BRAKE

M. Frazer, Barnsley, recently submitted a design for an electric brake that he incorporated in one of his models. In this a Ratchet Wheel is fixed on the shaft it is required to retard, and a Pawl is mounted on a slideable Rod that projects into the centre of a solenoid. When the solenoid is energized it draws the Rod into its interior, thus sliding the Pawl into engagement with the teeth of the Ratchet Wheel.

The brake is very effective in stopping a shaft rotating, but its action is much too violent to allow of its use in the majority of models. A more practical brake can be built up by using the solenoid to operate a brake band instead of the Pawl and Ratchet. The solenoid core should be attached to the free end of the brake band, which may be a cord working on the rim of a Pulley or a length of Sprocket Chain wrapped around the flange of a Flanged Wheel. When the core is drawn into the solenoid the band is tightened around the rim of the wheel, thus providing an effective retarding action.

If the brake is required to remain in tension when the solenoid is de-energised a Pawl is fixed on the moving Rod in such a manner that it engages with the teeth of a Rack Strip. In this case some form of trip mechanism must be arranged to lift the Pawl out of engagement with the Rack Strip when the brake is to be returned to the "off" position.

DRILLING MACHINE WITH AUTOMATIC FEED

Amateur woodworkers will be interested in a model hand-operated drilling machine constructed by G. Talbot, Carlisle. The most interesting feature of Talbot's machine is that the rate of feed of the drill varies in accordance with the rate at which the operating handle is turned. This enables one hand to be left free to manipulate the work.

The frame of the drill is constructed strongly of Angle Girders, and it is provided with a screw-operated clamp so that it can be fastened to the side of a bench. The drilling spindle is an 11½" Rod, and to the centre of this a ½" diam. × ¾" face Pinion is fastened. The Pinion meshes with a Contrate Wheel on the end of the hand-wheel shaft.

At the top of the drilling spindle is fitted a centrifugal governor of the usual type, and a loose collar at the lower end of the governor is connected by a fixed arm to the frame of the drill. The result of this arrangement is that as soon as the drill shaft is in motion, the arms of the governor tend to fly outward, thus forcing the shaft downwards. The greater the speed of the drill shaft, the greater is the downward pressure on the spindle. As soon as the drill is stopped the arms of the governor are returned to their original position by a thin rubber band passing round them.

Drills of all sizes up to 5/32" diameter are held in a chuck consisting of a Coupling, which is attached to the lower end of the drilling spindle. Talbot informs me that the machine is capable of drilling holes quite easily in three-ply wood.

A NOVEL PENCIL SHARPENER

An interesting suggestion for a practical pencil sharpener comes from F. Bradley, Southampton. Bradley's sharpener consists essentially of two Boiler Ends, around the rims of which fine glass paper or emery paper is glued. The Boiler Ends are mounted at an angle of about 30 degrees to each other, and are adjusted so that the nearer portions of the rims almost touch. The pencil to be sharpened is placed between the Boiler Ends, which are then spun round rapidly by turning a hand-wheel.

The base of the sharpener is a 5½" × 2½" Flanged Plate, and to it are bolted four 1½" × ½" Double Angle Strips that form the bearings for the two Boiler End shafts. Each shaft also carries a ½" Pinion, which meshes with a 57-teeth Gear on the driven Rod. This Rod is journalled in two Threaded Couplings, which are fastened by ½" Bolts to the Flanged Plate, but spaced from it by five Washers on each Bolt. The hand-wheel consists of a 2" Pulley, in one hole of which a Threaded Pin is secured.

The whole pencil sharpener is fitted in a box 5½" long, 2½" wide and 3" deep formed of Flexible Plates and Strips. The operating handle projects from one side of the box, and the ends of two 1½" Angle Girders from the opposite side. These Girders are clamped together and fastened in position by two Cranked Bent Strips, to form a guide for the pencil.

New Outfit Models

Suggestions for Large and Small Outfits

NONE of the four fine models we are describing this month requires an Outfit larger than Outfit No. 6 for its construction. They include a neat lathe built with Outfit No. 4, and driven by a *Magic* Motor, a grabbing crane constructed from Outfit No. 2, and a horizontal steam engine that can be built from the contents of Outfit No. 3. The fourth model is a fine reproduction of a Westland "*Lysander*" monoplane. This requires an Outfit No. 6 for its construction.

The model of the Westland "*Lysander*" aeroplane shown in Fig. 1 is particularly interesting as it demonstrates the value of Flexible Plates in reproducing the streamlined fuselage of a modern high-performance machine. The aeroplane on which the model is based was illustrated in the "*M.M.*" for January 1937.

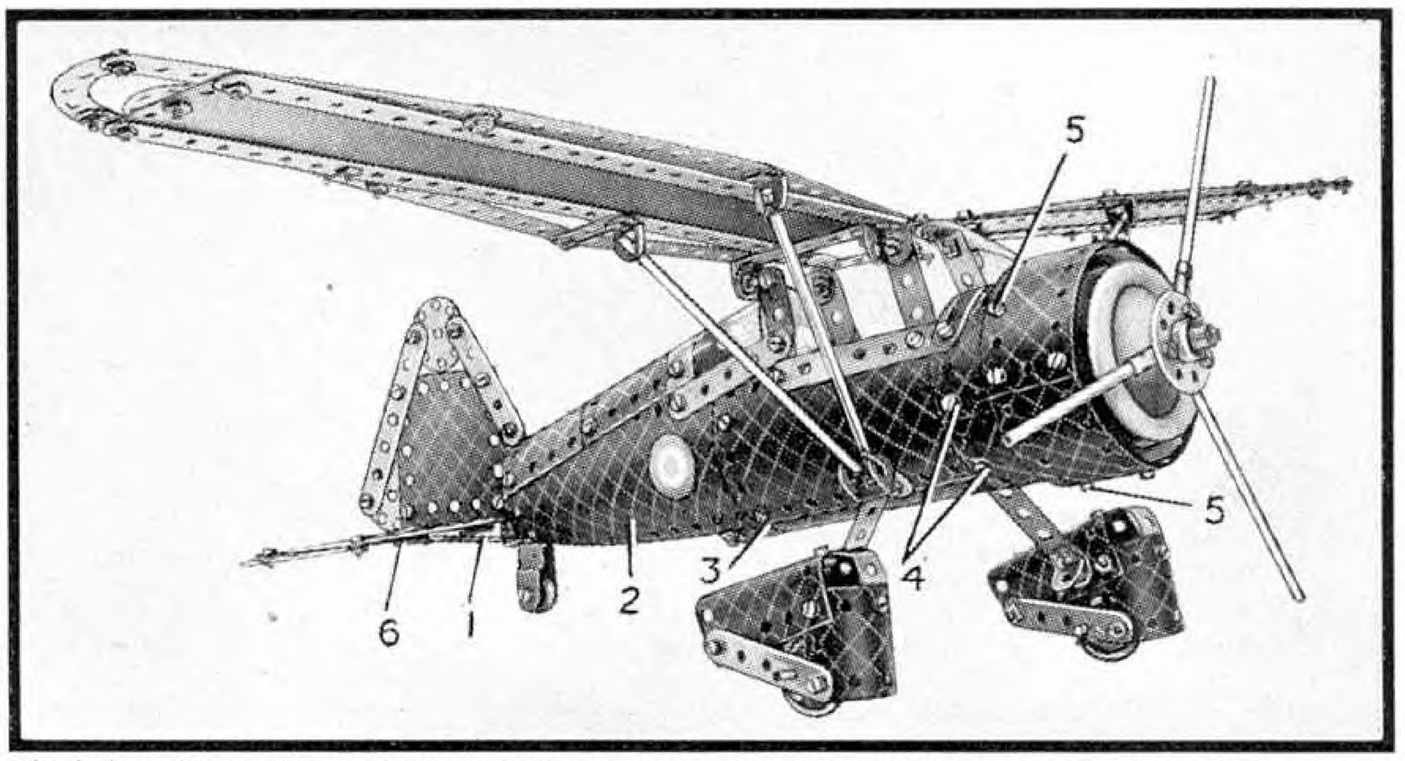


Fig. 1. A model of a Westland "Lysander" monoplane constructed with the parts of Outfit No. 6. The cockpits are fitted with windscreens made from transparent celluloid.

It is best to begin construction with the fuselage. Two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates 2 are first curved as shown and one corner of each is bolted in the seventh hole from one end of a $12\frac{1}{2}''$ Strip 1. The Plates are extended forward on each side by a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, the lower corners of which are bolted to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 3. The forward end of the fuselage, just behind the engine, is completed by bolting a cylinder formed from two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates to the $4\frac{1}{2}'' \times 2\frac{1}{2}''$ and $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. The cylinder is strengthened internally by three Formed Slotted Strips held by Bolt 4. The tail of the fuselage is sloped forward to the rear cockpit with two $1\frac{11}{16}''$ radius Curved Plates, and the sides of the cockpits are edged round as shown.

The engine cowling is made from two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bolted together to form a cylinder, and is attached to the fuselage by three $\frac{3}{8}''$ Bolts, two of which are indicated at 5. Each bolt carries four washers on its shank. The engine is represented by a 3" Pulley and a Road Wheel fastened on a 2" Rod, the Pulley being held in place by four bolts that engage in its groove.

The tail-plane consists of the halves of a Hinged Flat Plate, overlapped three holes and fitted at each end with a Semi-Circular Plate, 3" Strips being used to give it a tapered outline. The fin is built up in the manner shown, and together with the tail-plane is bolted to Strip 1.

The characteristic shape of the wings of the actual machine is reproduced as closely as possible in the model. Each wing consists of a $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate strengthened at each edge by a $12\frac{1}{2}''$ Strip. The leading and trailing edges each consist of three $5\frac{1}{2}''$ Strips, and are joined at the tip by a $2\frac{1}{2}''$ Cranked Curved Strip. The trailing edge is supported by a $1\frac{1}{2}''$ Strip and a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The two wings are joined together by overlapping their leading and trailing edges by three holes. They are supported from the front of the fuselage by two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, which are joined at their upper ends by a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. Their trailing edges are connected to the fuselage by $2\frac{1}{2}''$ Strips.

Parts required to build the model Westland "*Lysander*": 5 of No. 1; 12 of No. 2; 3 of No. 3; 2 of No. 4; 9 of No. 5; 2 of No. 6a; 2 of No. 10; 2 of No. 11; 9 of No. 12; 2 of No. 12a; 3 of No. 12c; 2 of No. 15; 1 of No. 15b; 4 of No. 16; 1 of No. 17; 3 of No. 18a; 1 of No. 18b; 1 of No. 19b; 2 of No. 22; 1 of No. 23; 1 of No. 23a; 1 of No. 24; 2 of No. 35; 102 of No. 37; 8 of No. 37a; 20 of No. 38; 1 of No. 40; 1 of No. 44; 1 of No. 48; 6 of No. 48a; 2 of No. 90a; 2 of No. 111; 1 of No. 111a; 5 of No. 111c; 2 of No. 155a; 1 of No. 187; 2 of No. 188; 4 of No. 189; 1 of No. 190; 2 of No. 191; 3 of No. 192; 2 of No. 197; 1 of No. 198; 2 of No. 199; 2 of No. 200; 2 of No. 212; 2 of No. 213; 2 of No. 214; 4 of No. 215; 4 of No. 217a.

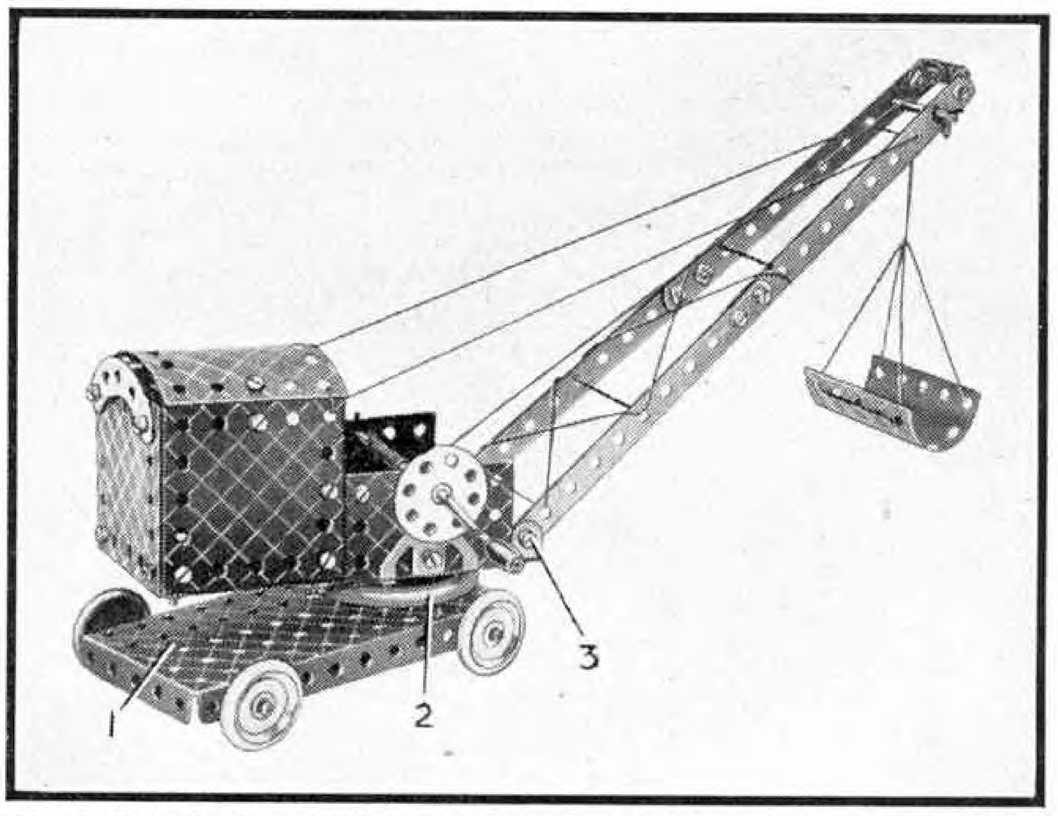


Fig. 2. This simple swivelling grabbing crane is a good example of a working model that can be built from the contents of Outfit No. 2.

The second model to be described is the miniature grabbing crane shown in Fig. 2. The base of this consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 1, which is mounted on 1" Pulleys fitted with Rubber Rings. The superstructure is built by bolting two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates side by side, and then fixing two Double Angle Strips to them. One of the Double Angle Strips provides support for the jib, and the other carries the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates that form the sides of the cab. These Plates are further supported at the rear by Angle Brackets, and similar parts are used to hold the back of the cab in position. The roof is a $1\frac{11}{16}''$ radius Curved Plate, and is attached to the sides of the cab by Angle Brackets.

The Crank Handle is journalled in two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates supported from the floor by Trunnions. The Bolts

holding the latter parts carry also $2\frac{1}{2}''$ Strips, which give additional strength to the base of the cab. The cab is pivoted on a $1\frac{1}{2}''$ Rod, which is held below the travelling base by a Cord Anchoring Spring and also carries a Road Wheel 2. The construction of the jib is clear from Fig. 2, and when completed it is pivotally attached to the cab by the lock-nutted Bolts 3.

Parts required to build the model grabbing crane: 4 of No. 2; 2 of No. 5; 3 of No. 10; 8 of No. 12; 2 of No. 16; 2 of No. 17; 1 of No. 19g; 4 of No. 22; 1 of No. 24; 4 of No. 35; 37 of No. 37; 4 of No. 37a; 4 of No. 38; 2 of No. 48a; 1 of No. 52; 1 of No. 90a; 2 of No. 111c; 2 of No. 126; 4 of No. 155a; 1 of No. 176; 1 of No. 187; 2 of No. 188; 2 of No. 189; 1 of No. 190; 1 of No. 199; 2 of No. 200.

A fine working model for owners of Outfit No. 3 is the steam engine shown in Fig. 3. This incorporates all the important mechanical features of an engine of its type, yet is quite simple to build. Construction should be commenced by assembling the base. The cylinder is formed from two $5\frac{1}{2}''\times2\frac{1}{2}''$ and two $4\frac{1}{2}''\times2\frac{1}{2}''$ Flexible Plates, each of the larger Plates overlapping the smaller one two holes.

The cylinder is bolted to the $5\frac{1}{2}''\times2\frac{1}{2}''$ Flanged Plate, and the piston rod 2 is inserted before clamping the Road Wheels that form the cylinder ends in place. The piston rod comprises two 4″ Rods joined by a Rod Connector. The valve chest 3 consists of two U-Section Curved Plates fitted with Trunnions, the upper Curved Plate being bolted to the cylinder wall while the other Curved Plate is attached to the Flanged Plate by a Flat Bracket. The valve rod is a $3\frac{1}{2}''$ and a $1\frac{1}{2}''$ Rod joined by a Cord Anchoring Spring.

The Crankshaft is then constructed. The $3\frac{1}{2}''$ Rod 4 carries a Bush Wheel fitted with a $2\frac{1}{2}''$ Strip and a flywheel 10 clamped between two 1″ Pulleys. Bearings for the 2″ Rod 5 are provided by the Semi-Circular Plate and a Reversed Angle Bracket, and it carries two $1\frac{1}{4}''$ Discs fitted with a second Reversed Angle Bracket and a $2\frac{1}{2}''$ Strip as shown, the unit being prevented from turning on the Rod by two Spring Clips. The crankpin 6, on which is journalled the connecting rod 7, is a 2″ Rod, and is held in position by Spring Clips placed in the positions shown. The details of the connecting rod are shown in Fig. 3. It is connected to the piston rod by a Rod and Strip Connector. The valve operating eccentric is built by gripping an Angle Bracket 8 in the boss of a 1″ Pulley with a set-screw. The valve connecting rod is pivoted on a bolt lock-nutted to Angle Bracket 8, while its other end is carried on a $\frac{3}{8}''$ Bolt 9. Bolt 9 is lock-nutted to a Double Bracket so that its shank clamps the valve rod in the holes of the Bracket. The eccentric is spaced from the Reversed Angle Bracket by a $\frac{1}{2}''$ loose Pulley. In order to ensure smooth operation, all moving parts of the model should be well oiled.

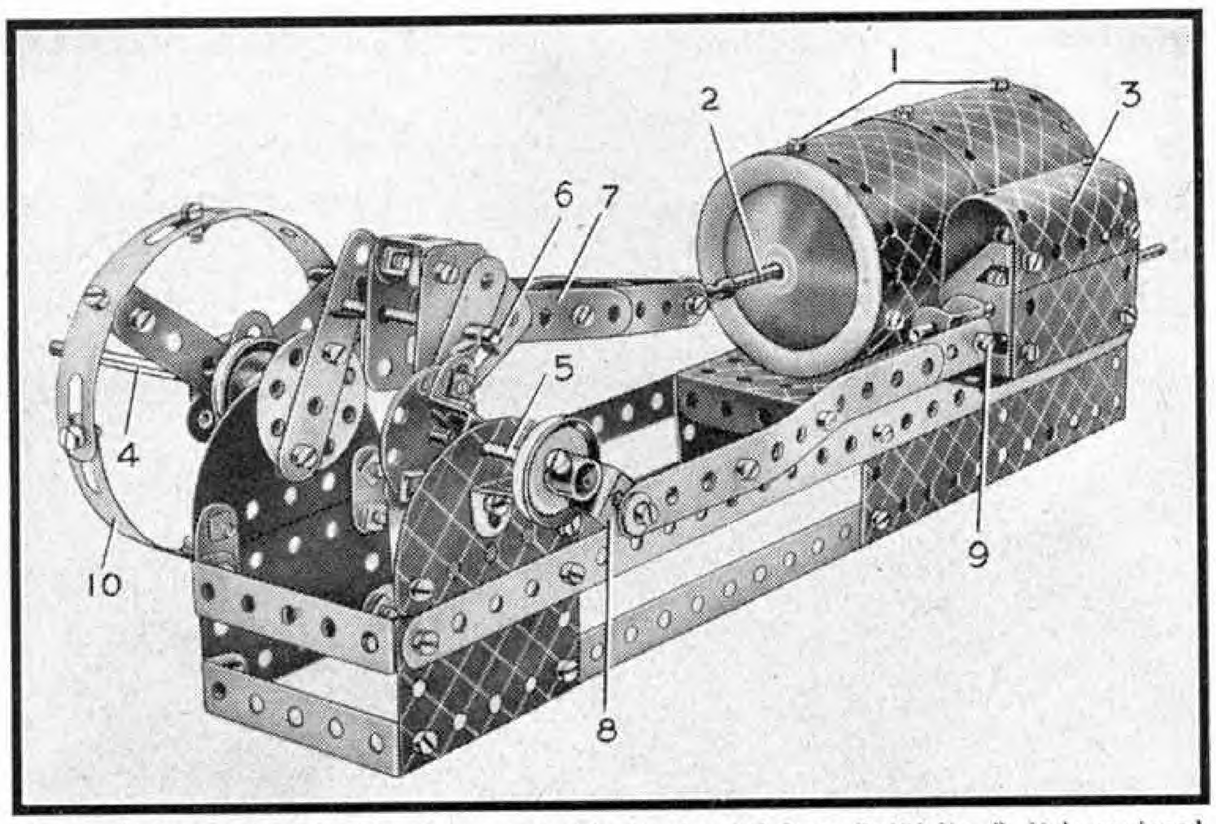


Fig. 3. This model horizontal steam engine is constructed from Outfit No. 3. It is equipped with working valve gear and a novel crankshaft that is easily built-up.

Parts required to build the model horizontal steam engine: 2 of No. 1; 4 of No. 2; 9 of No. 5; 5 of No. 10; 2 of No. 11; 4 of No. 12; 2 of No. 15b; 2 of No. 16; 2 of No. 17; 1 of No. 18a; 3 of No. 22; 1 of No. 23; 1 of No. 24; 6 of No. 35; 50 of No. 37; 56 of No. 37a; 6 of No. 38; 1 of No. 44; 2 of No. 48a; 1 of No. 52; 3 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a; 1 of No. 176; 2 of No. 187; 2 of No. 188; 2 of No. 189; 2 of No. 191; 2 of No. 192; 2 of No. 199; 1 of No. 212; 1 of No. 213; 2 of No. 214; 4 of No. 215; 2 of No. 217a.

The remaining model to be described is the lathe, which is shown in Fig. 4. Construction should be commenced by bolting two Trunnions 1 to a $2\frac{1}{2}''\times1\frac{1}{2}''$ Flanged Plate and then attaching a U-Section Curved Plate 2 to the latter by Angle Brackets. The head-stock so formed is attached to the left-hand Flanged Sector Plate, and is supported at its other end by Angle Brackets that are bolted to $2\frac{1}{2}''\times1\frac{1}{2}''$ Flexible Plates. The tail-stock is built up from two Flat Trunnions connected to the two $1\frac{1}{4}''$ Discs 4 by a Flat Bracket. The Discs 4 are spaced apart by washers, in order to allow them to slide freely along the $5\frac{1}{2}''$ Strips 3.

The saddle consists of a Cranked Bent Strip 5, to which is bolted a Reversed Angle Bracket that carries a $\frac{3}{8}''$ Bolt to represent the cutting tool. The shank of the former bolt carries a 1″ Pulley. The slide for the saddle is a $2\frac{1}{2}''$ Strip, and the saddle is prevented from moving too freely by a Flat Bracket spaced from the inside of the Cranked Bent Strip by a washer.

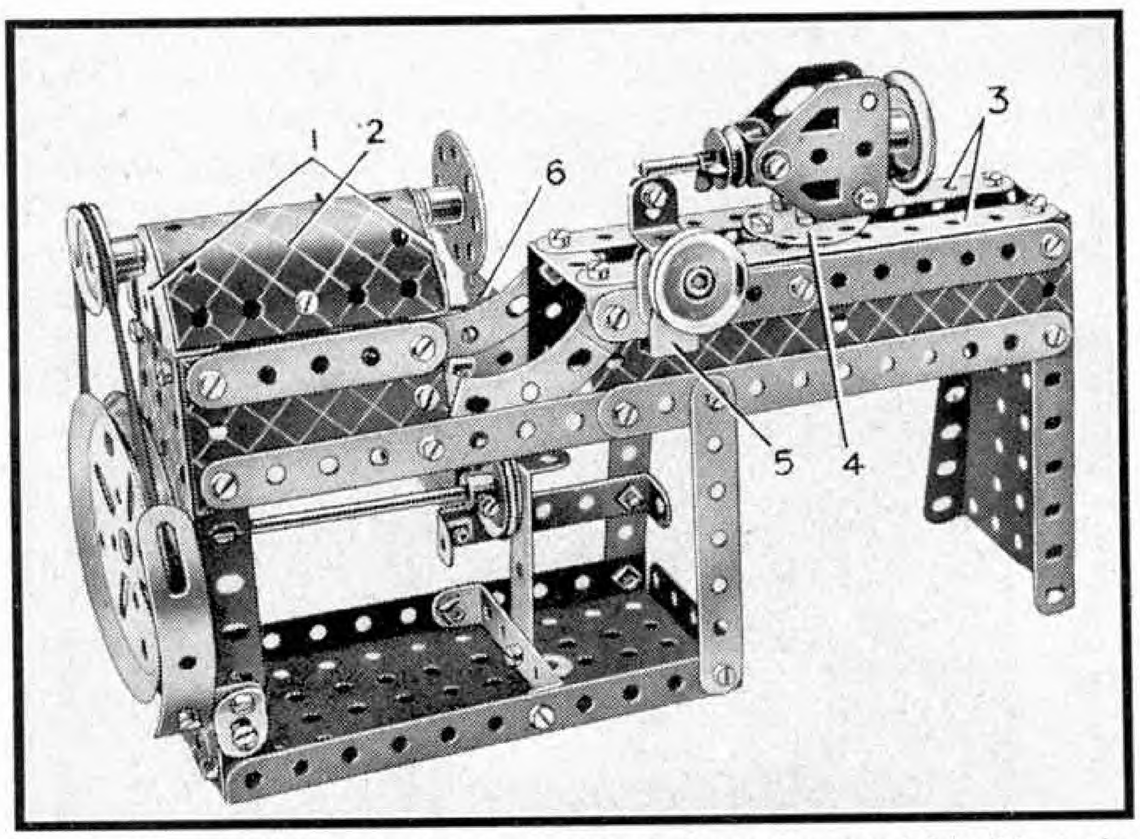


Fig. 4. The essential features of a power-driven lathe are incorporated in this sturdy model, which can be built with the parts included in Outfit No. 4.

The model is completed by constructing the base that supports the bed. This consists of a $5\frac{1}{2}''\times2\frac{1}{2}''$ Flanged Plate, which is bolted to the left-hand Flanged Sector Plate that forms one of the legs, and also is supported by $3\frac{1}{2}''$ Strips bolted to the bed. The driving shaft of the lathe is a 4″ Rod journalled at one end in the left-hand Flanged Sector Plate, and at its other end in a $2\frac{1}{2}''\times\frac{1}{2}''$ Double Angle Strip. The latter is bolted to a similar Double Angle Strip that is fastened to the $5\frac{1}{2}''\times2\frac{1}{2}''$ Flanged Plate. The Rod carries a 1″ and a 3″ Pulley, the latter being connected to a 1″ Pulley on the $3\frac{1}{2}''$ Rod.

The *Magic* Motor 6 is bolted to the rear of the lathe and is supported also by a Double Angle Strip. A Driving Band connects the Motor Pulley with the 1″ Pulley.

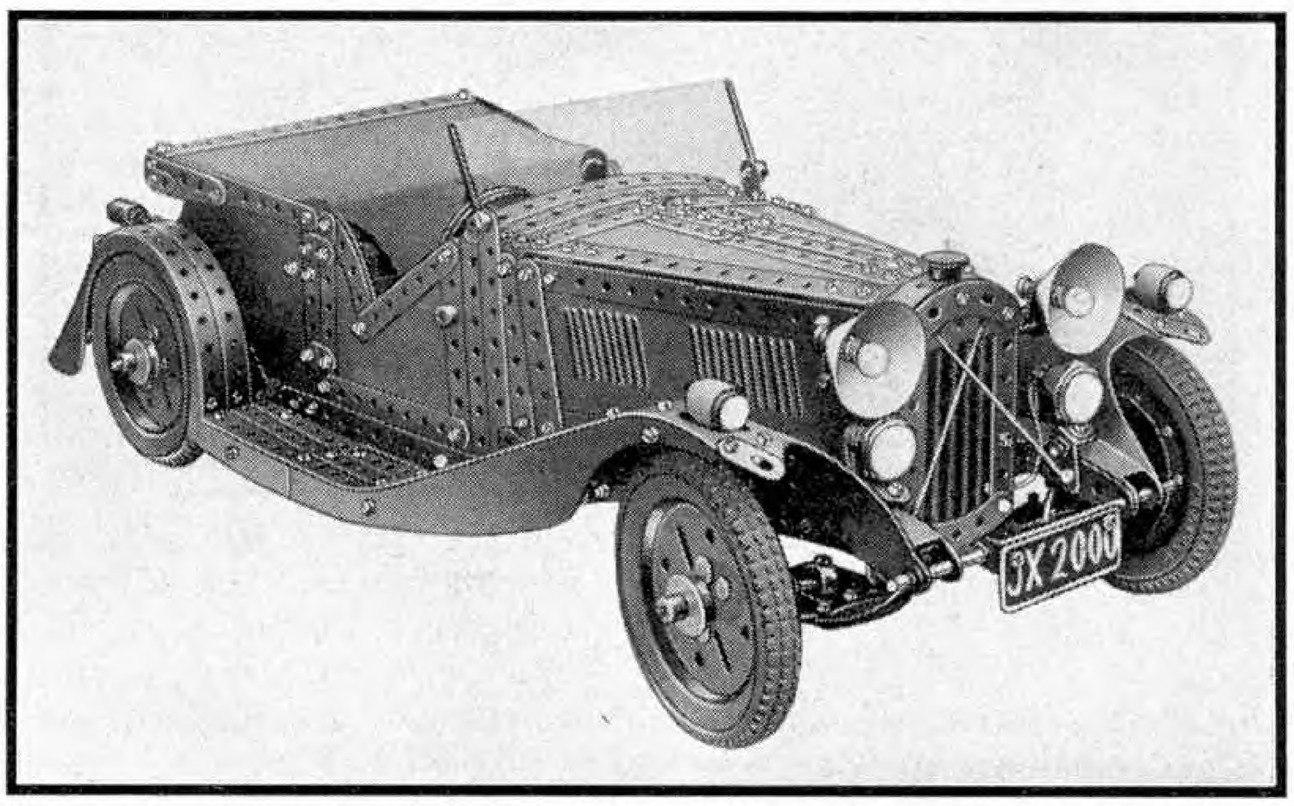
Parts required to build the model lathe: 8 of No. 2; 2 of No. 3; 3 of No. 5; 2 of No. 10; 2 of No. 11; 7 of No. 12; 1 of No. 12c; 1 of No. 15b; 1 of No. 16; 1 of No. 17; 1 of No. 18b; 1 of No. 19b; 4 of No. 22; 1 of No. 23; 1 of No. 24; 2 of No. 35; 58 of No. 37; 3 of No. 37a; 8 of No. 38; 1 of No. 44; 1 of No. 48; 3 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54a; 2 of No. 90a; 3 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 14 of No. 155a; 2 of No. 186; 2 of No. 188; 2 of No. 189; 1 of No. 199; 1 of No. 213; 1 of No. 215; 2 of No. 217a; 1 *Magic* Motor.

Model-Building Competitions

Fine Prizes for "M.M." Readers

Meccano "Originality" Contest

In our chief model-building competition this month prizes will be awarded to the competitors whose entries are considered the most original. Models of any kind and of any size may be entered, and the judges will base their decisions on novelty in choice of subject, in the use of Meccano parts and in design. Although new and unusual subjects should be looked for, those of the more ordinary type, such as ships, locomotives and motor cars, are not excluded, but with these competitors should endeavour to introduce some new method of construction or other novel features.



Model-builders on the look-out for novel constructional ideas will find plenty to interest them in this splendid model of a touring car. It was built by F. Dodgson, Halifax, for whom it won a prize in the "Christmas" General Competition, 1935.

Every model submitted must be the unaided work of the competitor entering it. There will be two sections, A, for competitors living in the British Isles, and B, for competitors living Overseas. There are no age limits, the contest being open to all Meccano enthusiasts, but the ages of competitors will be taken into consideration when the entries are being judged.

The prizes to be awarded in each section are as follows: First, Meccano or Hornby products value £3/3/–; Second, products value £2/2/–; Third, products value £1/1/–. There also will be consolation prizes of products value 10/6.

Readers should send in photographs or good drawings of their models, together with any explanations that may be necessary, although the latter should be made as brief as possible. Each competitor must write his full name and address on each sheet of his entry, and on the back of each photograph or drawing, and his age also must be given. Envelopes containing entries should be addressed *"Originality Competition,"* Meccano Ltd., Binns Road, Liverpool 13.

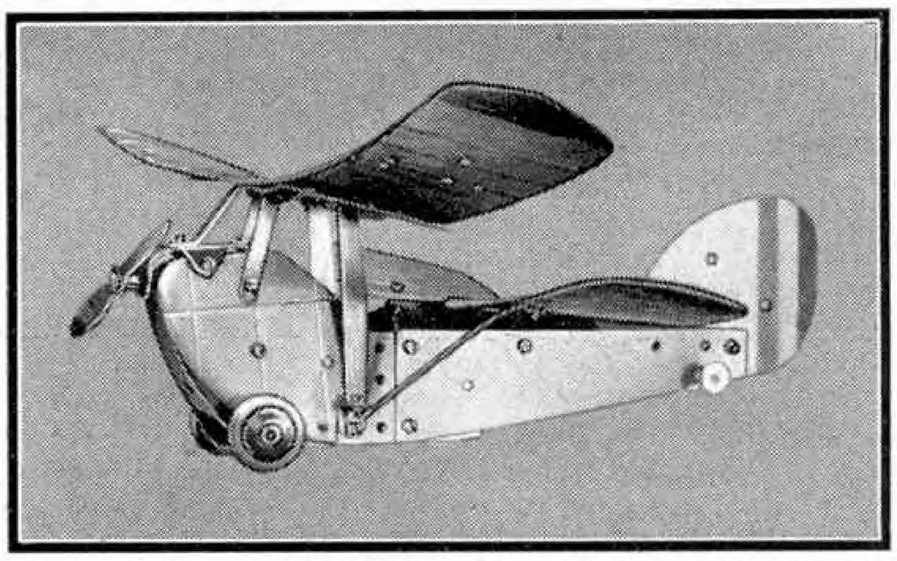
The closing date for Section A will be 30th June, 1938, and for the Overseas Section, 31st August, 1938.

Photographs or drawings of prize-winning models become the property of Meccano Ltd. Photographs or drawings of unsuccessful entries will be returned if desired, however, provided that a stamped addressed envelope of the necessary size is enclosed.

"Aeroplane Constructor" Contest

This month we are arranging another competition for the benefit of owners of Meccano Aeroplane Constructor Outfits. The present contest is similar to previous competitions of this type, and in it all that entrants are asked to do is to build a model aeroplane. The chief portions of each model submitted, that is the fuselage and wings, must be constructed entirely from Meccano Aeroplane Constructor parts, but a few ordinary Meccano parts may be used in reproducing small details, or for representing special features of certain makes of machines. If preferred models may be built entirely from Meccano Aeroplane Constructor Parts.

Hundreds of illustrations of real aeroplanes that will make fine subjects for models to be entered in this Contest have appeared from time to time in the *"M.M."* Many of these can be reproduced very accurately with Aeroplane Constructor parts, as the example illustrated on this page shows, and the more closely a model resembles the actual aeroplane on which it is based, the greater will be its chance of winning a prize.



An interesting model built from the contents of an Aeroplane Constructor Outfit. It is a remarkably faithful representation of a "Flying Flea," and is the work of A. Robinson, Salisbury.

The Contest is divided into two Sections, A, for competitors living in the British Isles; B, for competitors living Overseas. There are no age limits in these Sections, but the ages of competitors will be taken into consideration when judging the models.

The prizes to be awarded in each section will be as follows: Three prizes of Meccano or Hornby goods value £1/1/–; Three prizes of goods value 10/6; Six prizes of goods value 5/–.

Actual models must not be sent; instead photographs or drawings should be submitted. Each competitor must write his name, age and full address in block letters on the back of each photograph or drawing submitted, and the envelope containing these should be addressed to *"May Aeroplane Constructor Contest,"* Meccano Ltd., Binns Road, Liverpool 13. Section A will close on 30th June, 1938, but in order to give Overseas competitors sufficient time Section B will remain open until 31st August, 1938.

Model-Building Competition Results

By "Spanner"

Home and Overseas Prize-winners

"Yuletide Incidents" Competition

The novel "Yuletide Incidents" Competition, which was announced in the December 1937 issue of the *"M.M."* attracted a large number of entries that were ingenious both in design and construction. The prizes in the Home Section were awarded to the competitors named in the following list.

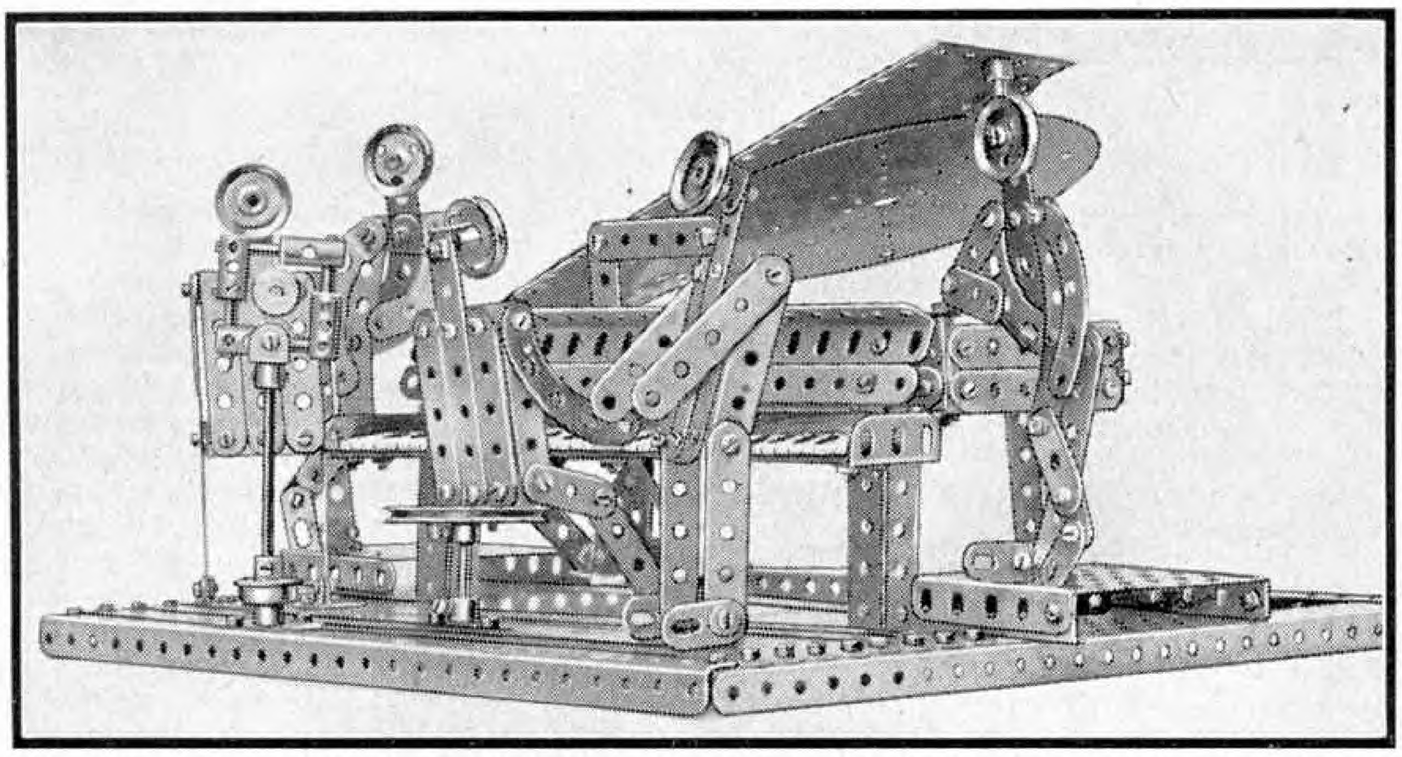
1st Prize, Meccano or Hornby products value £2/2/–: E. Dredge, Fordingbridge. 2nd, products value £1/1/–: R. Thorpe, Preston. 3rd, products value 10/6: E. Stoker, Liverpool 19.

Products value 5/–: H. French, Leeds 8; G. Henderson, Edinburgh 3; L. Slater, Portsmouth; R. Carman, Diss; D. Aitken, Rugby; F. Saunders, Folkestone; C. Watts, Kenton; S. Knighton, Eastwood; J. Hurst, Leicester; S. Williams, Bradford.

The First Prize was awarded for a simple but realistic model showing "Dad" manipulating the controls of a miniature Hornby Railway and seemingly having a great deal of fun, while his little son stands wistfully watching his parent's efforts! This is a Yuletide incident that is regularly witnessed in hundreds of homes! The figures in the model are nicely arranged and care has been taken to make them lifelike in appearance and pose.

In this prize-winning entry "Dad" is built up from Flat Trunnions and Strips, with a 1" Pulley for a head, and is shown kneeling down by the track operating the points. The boy, on the other hand, is standing in a corner, every inch of his person expressing ill-concealed displeasure as he waits impatiently for father to hand over the controls to their rightful owner! The track consists of Strips and Curved Strips bolted to a base, and at one point is crossed by a footbridge, which is represented by 1½" Strips joined by Obtuse Angle Brackets. A diminutive "simplicity" locomotive and a tender are ingeniously constructed from a few simple parts. The entry was submitted by E. Dredge, Fordingbridge.

Second Prize, was awarded to R. Thorpe, Preston, who built the excellent model illustrated on this page, representing several carol singers grouped around a grand piano. The piano is skilfully constructed of Strips and Angle Girders, and the keyboard is represented by a sheet of cardboard, on which the keys are painted. A great deal of care has been expended on the construction of the figures of the singers, each of whom has been given a different attitude. Two of the four are lounging with elbows on the piano, but all are singing with great gusto!



This model won Second Prize in the "Yuletide Incidents" Competition for R. Thorpe, Preston. It represents a group of carol singers and their pianist at a Christmas party, and is remarkable for the realistic effect obtained with the few Meccano parts used.

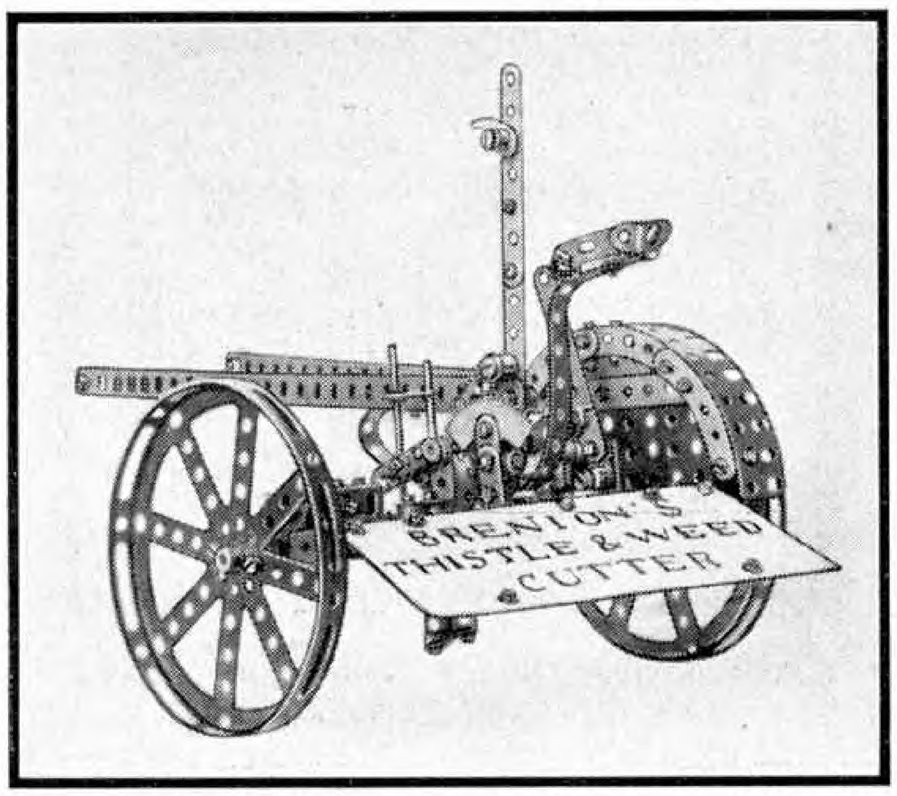
E. Stoker, Liverpool, who gained Third Prize, sent a simple model of Father Christmas riding in a sledge drawn by a reindeer. A novel and attractive feature of this model is that by operating two cords Father Christmas can be made to rise from his seat and urge on the reindeer by shaking the reins. The sledge is built up from Flanged Plates and Curved Strips, and Father Christmas himself consists of short Strips and Curved Strips with a 1" loose Pulley for his head. The figure has jointed limbs and by pulling one Cord it can be made to rise from the seat of the sledge, while pulling a second Cord raises the arms. The body of the reindeer consists of a Curved Plate, while short Strips are used for its legs and a ¾" Flanged Wheel for the head. The model is a really fine effort, especially for a constructor so young as Stoker, who is only nine years of age.

The model sent by J. Hurst, Leicester, consists of two figures standing one at each side of a Christmas tree. The joints of the figures are loose, and they are supported by Cords from above so that they can be made to dance like marionettes in a puppet show.

Among the other models that won the smaller prizes, that sent in by G. Henderson, Edinburgh, deserves mention. This represents a man on snow shoes, and is notable for the skilful arrangement of the Strips of which the figure is constructed. The snow shoes are built up from Flat Trunnions and 2½" Strips, and are threaded with Cord to make them look more realistic.

R. Carman, Diss, Norfolk, submitted an interesting model of a tobogganist that is very neatly constructed from a few parts. Great care has been taken to place the figure in a realistic attitude.

An amusing Yuletide scene showing "father" hanging up the festive decorations was sent by F. Saunders, Folkestone. "Father," who is the central figure in the scene, is balancing precariously on the top of a step-ladder, which is built up from Strips and Cord. Two other figures are also shown, one of which steadies the ladder, while the other gives instructions as to how the decorations are to be hung! If a little more care had been taken in designing the figures the model would have earned a higher award.



A fine model of the thistle and weed cutting machine that was the subject of the "Thistle Cutter" Competition. It won First Prize in the Home Section for N. Ta'Bois, Woodford Green.

"Thistle Cutter" Competition

In entering the "Thistle Cutter" Contest model-builders had to reproduce as closely as possible with Meccano parts the mowing machine illustrated on page 674 of the *"M.M."* for November 1937, and the prizes were awarded to those competitors whose models incorporated the best representations of its outstanding mechanical features. The entries received were most interesting, and considerable ingenuity was shown by many competitors in building up the various parts of the mechanism. The three principal prizes in each of the two Sections into which the Contest was divided have been awarded to the competitors named in the following list.

Section A (competitors living in the British Isles)

1st Prize, Meccano or Hornby products value £3/3/–: N. Ta'Bois, Woodford Green. 2nd, products value £2/2/–: W. Halsall, Burscough. 3rd, products value £1/1/–: Miss L. Slater, Portsmouth.

Section B (competitors living Overseas)

1st Prize, Meccano or Hornby products value £3/3/–: A. Butcher, Christchurch, New Zealand. 2nd, products value £2/2/–: L. Linder, Stockholm, Sweden. 3rd, products value £1/1/–: L. Edwards, Freemans Bay, Auckland, New Zealand.



The Fun of Exhibitions

Club Exhibitions are always great fun for members and visitors alike, and the latter invariably show their appreciation of the skill and industry of those who build up the displays they enjoy. I often wonder if either officials or members realise how far this appreciation goes, however. Visitors do not merely admire working models and Hornby railways; they also judge a club by what they see, and are quick to recognise the good features of club work. For this reason every detail of the Exhibition should be well thought out in order to make a really good impression.

The Right Club Spirit

An excellent example of the value of careful preparation was provided by the Annual Exhibition of the Mount Senior School, Newark, club. This included a fine variety of original models constructed by members, together with two large miniature railway systems; but to me the most outstanding features were the comments of the many distinguished visitors who were present. Among these were Councillor Dr. and Mrs. H. S. Hine, the Mayor and Mayoress of Newark, whose presence gives some indication of the esteem in which the work of the club is held. The prizes won in the various competitions were judged and presented by Canon H. Larken, Sub-Dean of Lincoln, who commented on the skill and ingenuity of the competitors. He also congratulated the members generally on the opportunities they had to turn their inventive brains into the right channels, and described the club as "another feather in Newark's cap."

This appreciation of the spirit behind the club is all the more gratifying in that the Canon himself has a remarkable scale model railway, and is an authority on constructional work of the type that he saw at the Exhibition. The Mayor emphasised his point by confessing that he and the Mayoress would like to sit down and play with the models and the miniature railways they had come to see! After this I am not surprised to learn from Mr. Beard, joint Leader of the club, that the club is growing so fast that it is difficult to find room for those who wish to join!

Details of this splendid Exhibition are given in the *"Club Notes"* on the opposite page. Excellent reports appeared in the Newark and Nottingham press, and the Leaders and members are to be congratulated on the example they have set.

The Correspondence Club

There are still urgent demands for more members of the Correspondence Club. Every new member of the Guild should join this club, which will give him splendid opportunities of keeping in touch with boys of similar tastes in other parts of the world, so that he can learn something of their lives and ways, and exchange news and stamps with them. Overseas members are more particularly required, and I can promise to provide Guild members from Australia, New Zealand, South Africa and Canada with correspondents without delay.



Mr. A. Elliott is Chairman of the Mexborough Secondary School Branch, No. 329, of the Hornby Railway Company, which was incorporated in July 1937. The Branch recently held a very successful Exhibition, at which a special feature was made of Meccano models, including Super Models on loan from Headquarters.

Take Photographs this Summer

By this time plans for the summer are well in hand in all Meccano clubs. No programme is really complete unless it gives members every opportunity of healthy open air activities, and I am glad to see that practically everywhere an excellent outdoor programme of games, rambles, cycle runs and excursions of all kinds has been planned. Camping, either for a special holiday period or at weekends, is one of the best ways of enjoying the summer, for those taking part learn to know each other better than they ever can do in ordinary clubroom life, and I hope that camps of some kind will be organised wherever possible.

There is one feature that I should like Leaders to keep in mind during all these activities. This is photography. Many clubs have a photographic section and the camera enthusiasts naturally practice on their fellow members and produce an excellent photographic record of club life. In other clubs there is practically always at least one member who is an ardent photographer, and with a little encouragement he would secure a record of the type that I have in mind.

The question of expense of course is important when the onus of taking photographs falls upon one, or perhaps two members. Members usually are willing to pay small sums for prints of photographs in which they figure, however, and a charge could be arranged that would cover out-of-pocket expenses.

I shall look forward to receiving many interesting snapshots showing members of clubs engaged in their various summer pursuits. I am always glad to reproduce suitable photographs in these pages, whether they are more or less formal groups or are of the humorous type, showing something of the fun and frolic of summer activities.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested should communicate with the promoters, whose names and addresses are given below:

ABERDEEN—A. G. Anderson, 87, Braemar Place, Aberdeen.

ASHFORD—J. Huddleston, Diyatalawa, Pound Lane, Kingsnorth, Ashford, Kent.

AUSTRALIA—P. Jitnikoff, Scrubview, Via Townsville, North Queensland.

BELFAST—K. Quigg, 77, Loopland Drive, Belfast.

BRIGHTON—N. A. Levick, "Northview," 269, Old Shoreham Road, Portslade, Brighton.

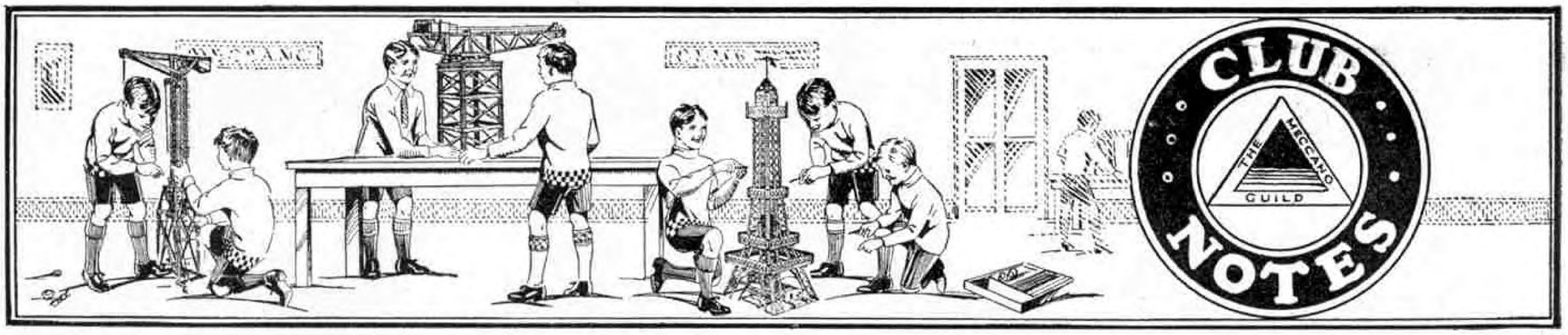
CHELTENHAM—G. Denley, 8, The Grange, Charlton Kings, Cheltenham.

CULLOMPTON—Mr. T. Jones, 11, Exeter Hill, Cullompton, Devon.

DRIFFIELD—B. W. Cole, 23, Middle Street, North, Driffield.

DUNMOW—J. G. Read, The Whalebone, White Roding, Dunmow, Essex.

LONDON—G. Thomas, 212, Victoria Road, Wood Green, N.22.



Leas School (Hoylake) M.C.—Model-building activities continue to be as popular as ever. Interesting talks have been given on "*Safety at Sea*," "*R.A.F. Fighting Aeroplanes*" and "*Railway Progress*" respectively. Films borrowed from the Kodak Library have been shown with the aid of a projector kindly loaned to the club. *Secretary:* H. W. Simpson, The Leas, Hoylake, Cheshire.

Bexleyheath M.C.—There have been good attendances at all meetings, and the many fine Meccano models constructed include cranes, lorries, liners and various workshop tools. A fully-equipped model workshop has been built for display on the School Open Day. Several interesting Lantern Lectures have been given. Club roll: 28. *Secretary:* J. V. Marsh, 105, Upton Road, Bexleyheath, Kent.

28th Edinburgh M.C.—Interesting Meccano models of all sizes were displayed at the recent Exhibition. An outstanding one was a large Eiffel Tower model, several feet high, that incorporated a lift. Coloured lights outlined the Tower effectively, especially when the room was in darkness. Musical entertainment was provided by members. *Leader:* Mr. W. Brotherstone, 1, Belhaven Terrace, Morningside, Edinburgh.

Islington M.C.—At the regular Model-building meetings definite subjects were specified, and as a result many interesting types of cranes and bridges have been constructed. Hobbies Evenings are devoted chiefly to Woodwork and Stamp Collecting. Club roll: 6. *Leader:* Mr. V. Miller, 25, Bewdley Street, London, N.1.

Mount Senior School (Newark-on-Trent) M.C.—The recent Annual Exhibition was open for two evenings, and attracted many distinguished visitors, including the Mayor and Mayoress. A fine display of Meccano models was arranged, including a steam roller, swing boats, and a penny-in-the-slot machine, and two large model railway systems also were displayed, in addition to a true-to-type Meccano model of the L.N.E.R. "*Cock o' the North*." The prizes won in the competitions were presented by Canon Larken, Sub-Dean of Lincoln, who spoke highly of "the delightful display of skill and ingenuity." Club roll: 44. *Secretary:* E. Masding, 2, Lime Grove, Newark, Notts.

Barnard Castle School M.C.—A new Chairman and Secretary were elected at the commencement of the Easter term, and good progress has been made under these officials. Model-building and Hornby Train operations have been enjoyed by members. A Draughts Contest is being held. Club roll:. 9. *Secretary:* K. R. Southern, Barnard Castle School, Barnard Castle, Co. Durham.

Royds Hall Grammar School M.C.—Good attendances have resulted in very successful meetings. A Model-building Contest has been held, and prizes were kindly presented by Barkers Ltd., local Meccano dealers. There were three sections, for Meccano models, Hornby Train layouts, and models constructed from any other Meccano products respectively, and entries were judged by a member of the Engineering Department of the Huddersfield Technical College. Visits to places of interest are being arranged for the summer. Club roll: 40. *Secretary:* D. Livesey, 30, Heathfield Road, Golcar, Nr. Huddersfield.

St. Stephen's (Saltash) M.C.—Part of the proceeds of the recent Exhibition has been used to provide further equipment for the Meccano, Hornby Train and Woodwork Sections. Models built by members were displayed at the Exhibition of the Plymouth M.C., and an anonymous admirer presented the club with a copy of the "*Handicrafts Annual*" in recognition of their merits. Visits are exchanged with the Plymouth M.C. and the Elmside (Exeter) M.C.—The Model Section is constructing equipment for the club's railway layout. Games are played at all meetings, and rivalry is particularly keen when Miss Porter, the President, joins in. Club roll: 7. *Secretary:* B. Braund, 9, Homer Park, Saltash.

Hornsea M.C.—Regular meetings have been held by the various sections of this energetic club. In addition to Model-building, the programme has included Lantern Lectures on such interesting subjects as "*The Manufacture of Chocolate*," "*Telephones*" and "*Shackleton's Expedition to the South Pole*." Social Evenings have been held regularly, and at these the game of "*Monopoly*" is a firm favourite. Club roll: 19. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

Folkestone M.C.—Considerable attention has been given to accessories and scenic effects on the Hornby layout of the associated H.R.C. Branch. The Meccano cranes at "Folkestone Harbour" have been improved, and are now in regular operation loading and unloading cargo boats and freight trains. Sacks containing coal have been made for use on the railway. New model steamers have been constructed for the cross-channel services run in connection with the boat trains, and existing steamers have been overhauled and repainted. A model motor launch is being constructed for use on the local park lake during the summer. A game of football was greatly enjoyed on one afternoon. Club roll: 9. *Secretary:* W. F. Cotter, 52, Hill Road, Folkestone, Kent.



Members of the Stretford Public Libraries M.C., affiliated in February 1937 under the Leadership of Miss F. Scattergood, who is on the right of our photograph, with Mr. W. Threlfall, President, on the extreme left. Particularly keen interest in model-building is shown by members. Lantern Lectures on a wide range of subjects are given regularly, and Stamp Collecting and Debates also are popular.

Exeter M.C.—Model-building continues to be the outstanding feature of the club's programme, and energetic constructional work recently produced a record number of models for the month. Two football teams are now maintained, and many keen games have been enjoyed. Darts have been introduced, and are gaining popularity. A number of unexpected visitors from other towns and clubs have been welcomed, and parties from the Sidmouth and Plymouth clubs paid a visit by arrangement. Club roll: 60. *Secretary:* J. T. Fenwick, 45, Colthorpe Road, Exeter.

The Beeches (Jersey) M.C.—Model-building continues to be the chief item of the club's varied programme. Impromptu speeches were given at one meeting, and prepared speeches lasting five minutes were the feature of another. A Hornby Train Evening proved very popular. A Magazine is to be published shortly, and keen interest is being taken in its production. Lantern Lectures have been given by the Leader. Of these, two on "*Italy*" and "*South Africa*" respectively were of outstanding interest. Club roll: 28. *Secretary:* D. Nicolle, De La Salle College, The Beeches, Jersey, C.I.

Barking M.C.—The club's Birthday was appropriately celebrated by a party to which ex-members were invited. A "Criticism Evening" has been held at which models were closely examined and discussed. Evenings devoted to Hobbies and to Hornby Train operations were enjoyed, and the latter are to be repeated regularly. Club roll: 18. *Secretary:* R. Walling, 18, Ashburton Avenue, Ilford, Essex.

Regent Street Central School M.C.—Model-building has been alternated with games and entertainments. Lectures have been given on "*The Boat Race*," by Mr. Chaplin, and on "*Angola*," by Mr. Pace. A Boxing Tournament provided a good opportunity for vocal competition in encouraging competitors. Club roll: 150. *Secretary:* J. Shepherd, 29, Bury New Road, Heywood, Lancs.

AUSTRALIA

Maylands M.C.—A Magazine is now issued and a mouth organ band with 30 members has been formed. Keen rivalry continues between the various Factions and attendances have been high. Much merriment was caused by a cinematograph show of cartoons. Club roll: 32. *Secretary:* R. Le Cheminant, 60, Crawford Road, Maylands, Western Australia.

Thebarton Technical School M.C.—A special display of the club's various activities was given at the School's Demonstration Night. A variety of working models were shown, and a meccanograph, although not the most elaborate model, created special interest among visitors. A radio transmitting station "VK5TT" is maintained by members of the Wireless Section, and communication has been established with other amateur stations in Australia. The club has contributed £3 towards the purchase of a film projector by the school. Club roll: 79. *Secretary:* B. S. Clarke, 21, Victoria Street, Glandore, South Australia.

EGYPT

Cairo M.C.—Good progress has been made, and many Meccano and wooden models have been built. An interesting visit was paid to Almaza Airport, where several aeroplanes were inspected. At a recent meeting the Correspondence Club was discussed, and Miss Mary Douglas, a Canadian staying in Cairo, gave a talk on this subject. Club roll: 30. *Leader:* Mr. M. F. Awad, 36, Haret El Garamony, El Assal, Shoubra, Cairo, Egypt.

Zagazig and Misr M.C.—A special Visitor's Evening was held in celebration of the wedding of King Farouk and Queen Farida, and a fine display of models included replicas of the crown and various state coaches. Musical items were provided by an orchestra. Many attractive models have been entered in the fortnightly Model-building Contests, an outstanding one being a bucket dredger. Models were shown at the Egyptian-Holland Industrial Exhibition in Cairo. A Visit has been paid to a local Zoo, and cycle excursions also have been enjoyed. Members took advantage of an invitation by the Egyptian National Flying Company to attend an interesting Lecture on "*Sky Navigation*." Other visits have been made to a local power station and a water purifying and drainage plant. Club roll: 19. *Secretary:* A. S. Mangourie, 13 Sharia Badir, Zeitoun, Cairo, Egypt.

NEW ZEALAND

Christchurch M.C.—At a special meeting appreciation was expressed of the good work of P. Chapman, secretary of the club for a long period, who has moved to Dunedin, and he was presented with a suitably engraved gold propelling pencil. A surprise visit was paid to the Ashburton M.C., where the secretary was presented with an autographed photograph of the latter club. Bad weather caused the abandonment of a picnic, and at an indoor meeting held instead A. Laban gave an account of his recent tour of the Meccano Factory at Liverpool. An enjoyable supper was provided by the secretary at the last meeting he attended. Club roll: 40. *Leader:* Mr. J. Ancall, 78, Spencer Street, Addington, Christchurch, New Zealand.

SOUTH AFRICA

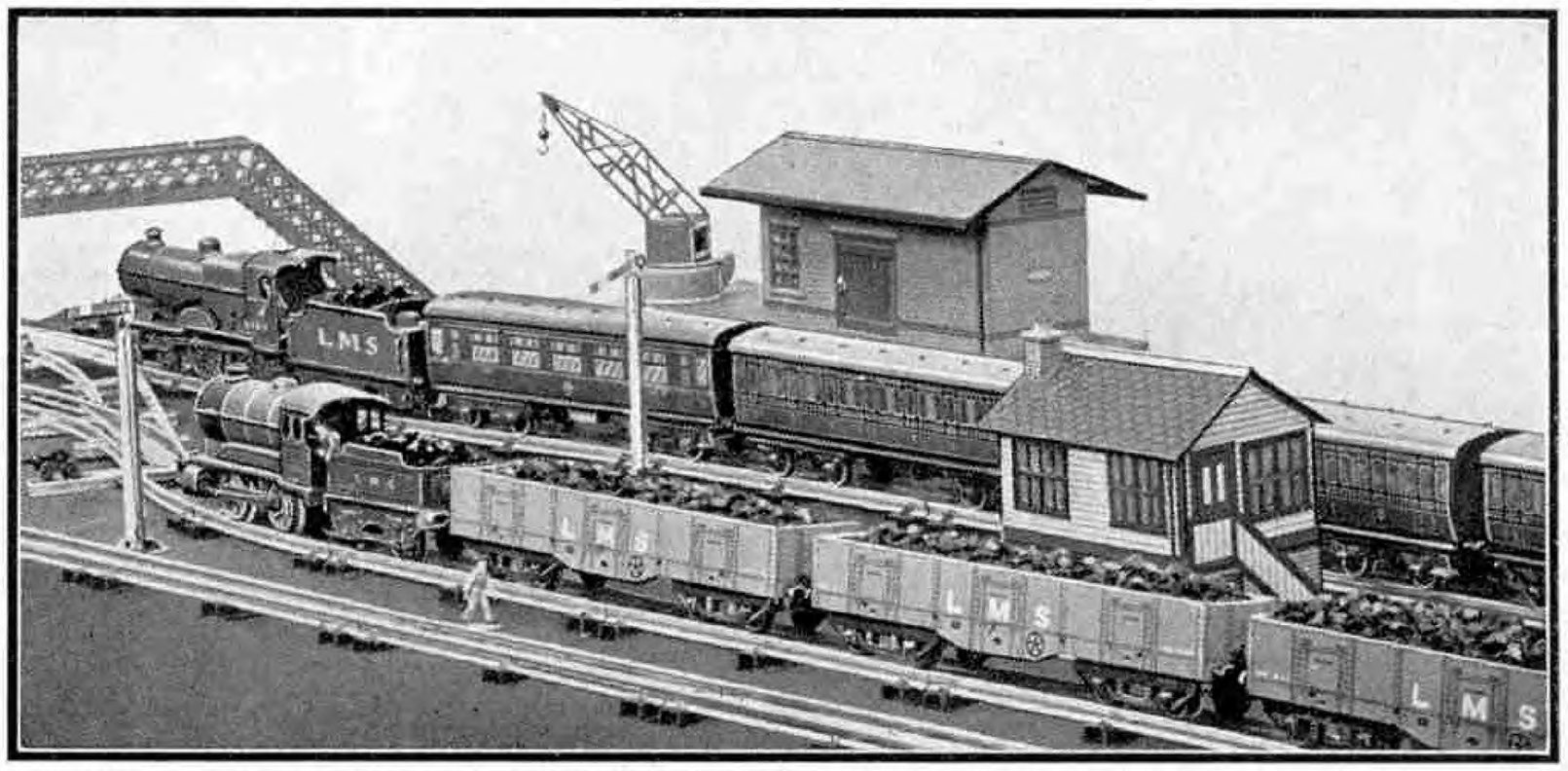
Pioneer M.C.—At the Annual General Meeting a very favourable report of the year's working was given, a good financial position being shown. Visitors complimented the club on the excellence of the models exhibited, and appreciation also was expressed of the good work done by the Thrift Club. A Cycle Race held recently provided many thrills and spills. Club roll: 10. *Secretary:* A. H. Alley, 461, Burger Street, P.M.B. Natal, South Africa.

Playing with Hornby Goods Wagons

Fun with Miniature Loads

IN the early stages of the development of a layout it is usual for the model railway owner to collect together a varied assortment of rolling stock, adding this vehicle and that as each appeals to his fancy. At this period, especially with younger boys, the real possibilities of the various wagons and the fun that can be obtained from them are not always realised. It is the purpose of this article to suggest, to younger readers particularly, how to play with their Hornby Rolling Stock.

At the commencement of operations goods vehicles are usually more favoured, possibly because of the fun that can be had in loading and unloading them. The first point to settle is what to load them with. For the open wagons that form standard equipment in the smaller Train Sets the first material that suggests itself is coal. This is realistic, but dirty to handle. Apart from its effects on the hands and faces of model railwaymen, the dire result of overturning a wagon of coal on the dining room carpet must not be overlooked. Fortunately there is now no need to use real coal, for Hornby Coal is a splendid substitute, specially made for loading into miniature wagons. This material looks exactly like coal, but is perfectly clean to handle and is so light that it does not make a loaded train difficult for the engine to haul.



A freight train waits in the siding while a passenger train passes on the main line. The freight train is made up of No. 2 High Capacity Wagons loaded with Hornby Coal for a locomotive depot down the line.

Hornby Coal does away with the need for using any of the familiar household substances, such as rice or dried peas that have long been popular as miniature loads. These can of course still be used to represent certain substances other than coal, such as broken stone, and good fun can be had with the ordinary open Wagons of the Hornby Series carrying loose loads of this kind representing coal or stone traffic. They have to be loaded or unloaded by hand, and for this purpose a small spoon is very useful, although it forms rather an out-of-scale shovel. It is far more exciting to load the Hopper Wagon or the Tipping Wagons of either the side or rotary types, for these can be made to discharge their loads in a highly realistic manner. The Hopper Wagon is arranged with bottom doors, so that the contents are let down between the rails when the doors are opened by means of the operating handle at the side of the Wagon. This is a useful feature when the rails in a siding devoted to coal or stone traffic can be raised up sufficiently to allow miniature road vehicles to pass underneath, for the transfer of the load from rail to road wagon can then be carried out directly. If the road vehicles are made to back under the rails, the latter need only be raised high enough to clear the bodies of the lorries. A few small blocks of wood, or possibly some pieces from a set of miniature building bricks can be used to pack up the rails. A better scheme still is to make a framework of Meccano parts to form a suitable gantry over which the rails can be laid.

Coal or stone can be conveyed in odd wagons attached to general goods trains, for this is quite a convenient and realistic method of conveying the traffic in miniature. On larger layouts, however, where several vehicles of the same kind are often available, special trains conveying only coal or stone can be run. In addition to the Hornby No. O and No. 1 Wagons, which include representatives of each of the four railways, there are High-Capacity Wagons in the Hornby Series that are miniatures of the bogie coal wagons of the L.M.S. and G.W.R. and the brick wagons of the L.N.E.R. respectively. A coal train consisting entirely of High-Capacity Wagons looks very impressive, but average practice in this country will be better represented in miniature by a single High-Capacity Wagon and several of the ordinary four-wheeled kind. The real high-capacity wagons are usually employed for the conveyance of coal for special purposes, such as for supplying locomotive depots of the company, power stations or works along the route.

Before leaving the loose loads of the kinds that we have just described, we must not forget the Hornby Bricks that are now available for loading into wagons. These miniatures are particularly intended for use with the L.N.E.R. High-Capacity Wagon. They are packed in boxes holding 100 each, and when the contents of a box are arranged on the lid, which fits inside the body of the wagon and forms a false floor, they form a complete layer one brick deep with another in the centre part of the vehicle. This false floor arrangement prevents overloading of the wagons and allows realistic effects to be obtained with a small amount of material.

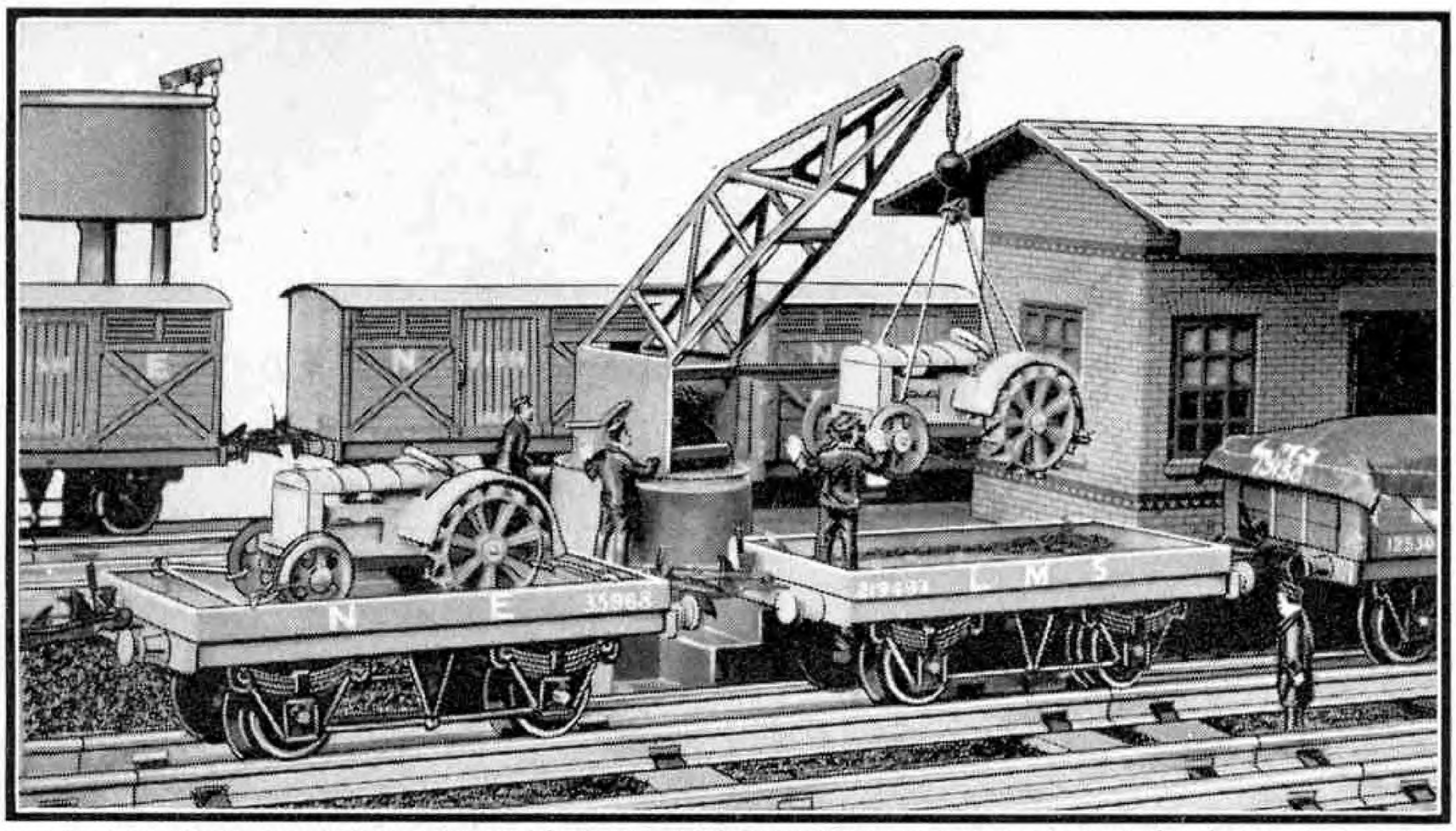
Certain Hornby Wagons can be obtained already provided with a suitable load. One of the best known of these is the Flat Truck, which can also be obtained without a load at all. Its design is based on the common

type of low-sided wagon that is employed for such a wide variety of duties in actual practice. The Flat Truck is fitted with rings attached to its sides for securing various loads, and numerous uses for it can be devised by the keen model railway owner. As a loaded vehicle the Flat Truck is available with a miniature cable drum on it, or carrying a container representing the various kinds used by the four railway companies.

The Cable Drum makes an interesting load, particularly as it is secured on the Flat Truck in the manner followed in actual practice. "Ropes" of Meccano Cord are passed from the rings on the sides of the wagons to those on the other side through the hollow centre of the Cable Drum. This results in a firm fixing of the load. Cable drums are common objects in these days of extensions of the use of electricity, so that it is reasonable and realistic to make good use of them on a miniature railway.

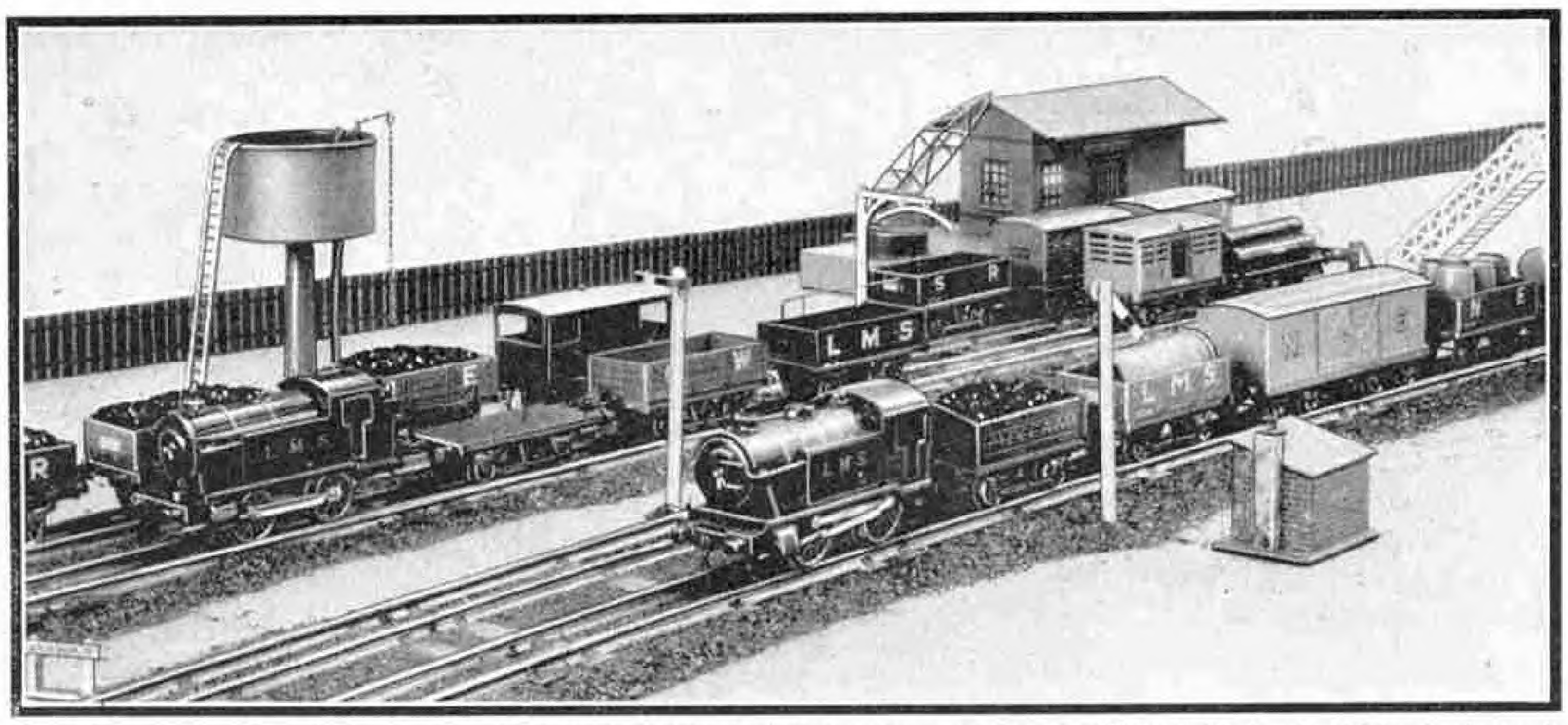
Miniature Containers add a modern touch to a layout, and a special feature can be made of their loading and unloading by means of the separate Hornby Platform Crane, or the similar crane mounted at one end of the No. 2 Goods Platform. The Containers are fitted with lifting chains, and an "eye" or ring connecting them by means of which they can be attached to the crane hook. It is interesting to shunt a loaded Flat Truck so that the jib of the crane can be slewed to come directly over it. Then the crane hook is passed through the ring and the container is lifted with a business-like chatter from the ratchet as the crane handle is turned. At the same time the crane jib can be slewed by operating the handle provided for the purpose so that the Container can be placed on a road vehicle, if one is available, or transferred to another wagon; or simply left on the Goods Platform or the ground.

Many other loads can be carried on the Flat Truck. For instance, the motor vehicles of the Dinky Toys Series are very suitable. The Tractor, Dinky Toys No. 22e, makes a good load, and some interesting operations are necessary to permit it to be lifted correctly. It is best to make a special sling of Meccano Cord consisting of four ropes joined to one another about the centre where they are suspended from the crane hook. Each rope can be fitted with a small wire hook if possible, and if this is done much time will be saved in handling different loads. In order to lift the Tractor the hooks of one pair of ropes must be attached inside the wheels to the front axle. The hooks of the other pair will deal with the rear of the vehicle, and can simply be hooked to the inner corner of the large "splashers" that partially cover the rear wheels of the Tractor. Alternatively some form of lifting beam—a match stick is suitable—can be passed across under the splashers at the rear, and the hooks can be attached to this. The same sling probably will do for other motor vehicles that may have to be lifted on or off the Flat Truck.

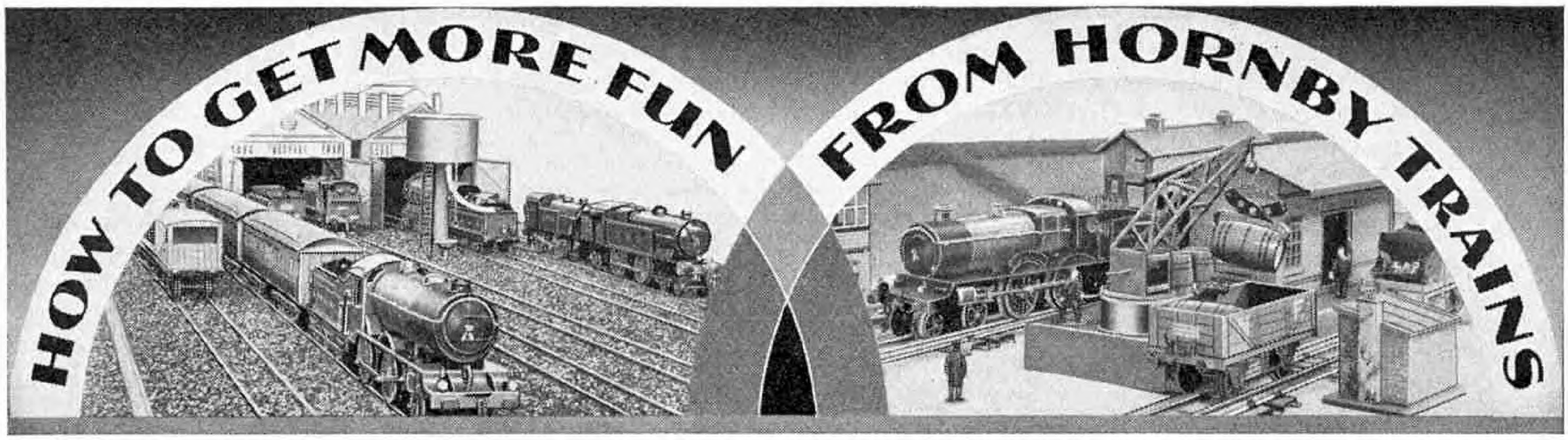


Meccano Dinky Toys motor vehicles make attractive loads and it is interesting to carry out loading operations in the correct manner. This photograph shows a Tractor lifted by the crane by means of a miniature sling made as suggested in this article.

The miniature barrels fitted on to the Hornby Barrel Wagon are most effective. For lifting these by means of a crane a special type of sling can be devised, but it is more satisfactory to make use of the Crane Grab, Meccano Part No. 150. These Grabs have a "scissors" action that enables them to grip securely any load that can be accommodated between the jaws. The Crane Grab is attached to the hook of the Goods Platform Crane, and by using this tackle the Barrel Wagon can be loaded or unloaded in an efficient manner. Some Hornby Railway owners make good use of the ordinary bobbins used for cotton that are to be found in every household. These vary in shape, but the most suitable for miniature railway purposes are the short thick ones which, whether painted or not, make excellent miniature kegs or drums. When loaded into an Open Wagon they should be covered over with a Hornby Wagon Tarpaulin.



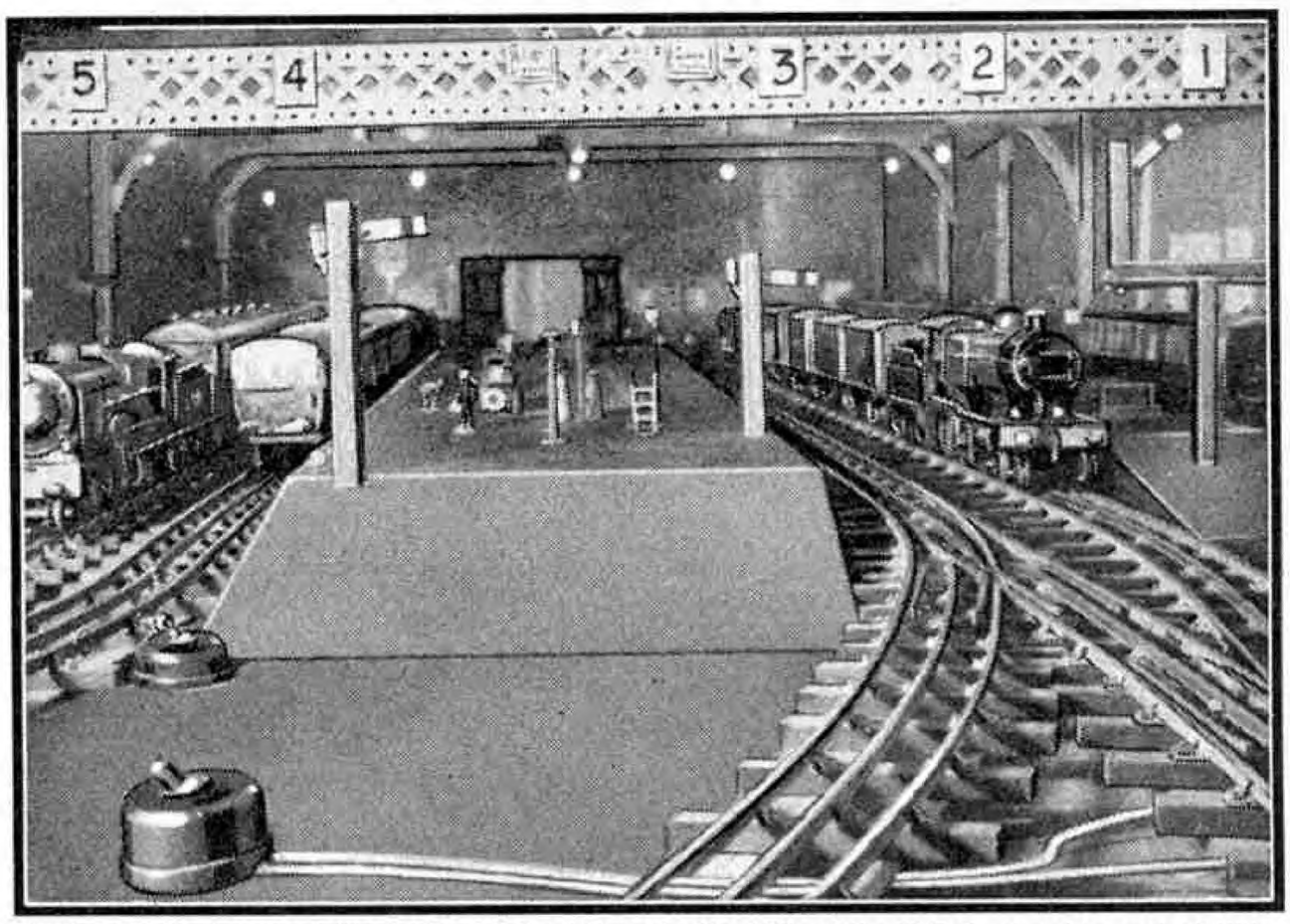
An interesting goods yard scene on a Hornby Railway. A freight train consisting of different kinds of vehicles is shown in the foreground and in the yard itself shunting operations are going on.



AN ATTRACTIVE H.R.C. BRANCH LAYOUT

THE reproduction in miniature of a particular railway is a very popular scheme with many Hornby railway owners. A railway planned in this manner is particularly suitable for Branches of the Hornby Railway Company, and this month we describe an interesting example of a Branch layout representing a definite section of real railway. The Branch concerned is that at Bedford School, No. 310, which has developed on these lines since its formation in 1936. Bedford is between St. Pancras and Leicester on the Midland Division route of the L.M.S. Thus there was good reason for the choice of this line for the Branch layout, and members carry out their operations in a typical "Midland" manner, as regards traffic, locomotives, and control characteristics.

The track is arranged on a raised baseboard built almost completely round the four sides of a room. Its non-continuous character makes it specially suitable for timetable working, and for regular programmes of operations planned to represent the traffic that is dealt with in actual practice. Both clockwork and electric trains are run, the whole of the main line from "St. Pancras" to "Leicester" being electrically operated and laid with steel rails assembled by the Branch members themselves.



A view on the layout of the Bedford School Branch, No. 310, of the H.R.C., showing part of "St. Pancras" Station. On the right of the photograph a Hornby Standard Compound Locomotive is on the point of departure with a train.

Part of the system represents the real Tilbury section and branches off from the main track to a miniature representation of Tilbury Station. This "Tilbury" line was an early development in the scheme of things, and is composed of standard Hornby Tinplate Rails. It is operated solely by clockwork engines.

Electric power is supplied by means of Meccano Transformers and the layout is divided into sections, with Transformers and control equipment at various points so that several operators can take part in the running programme and several trains can be run at one time. In addition to the general sectionalising of the track, there are local push-button switches for the purpose of controlling short sections at different points independently, especially in connection with buffer-stop sections at the terminals and elsewhere.

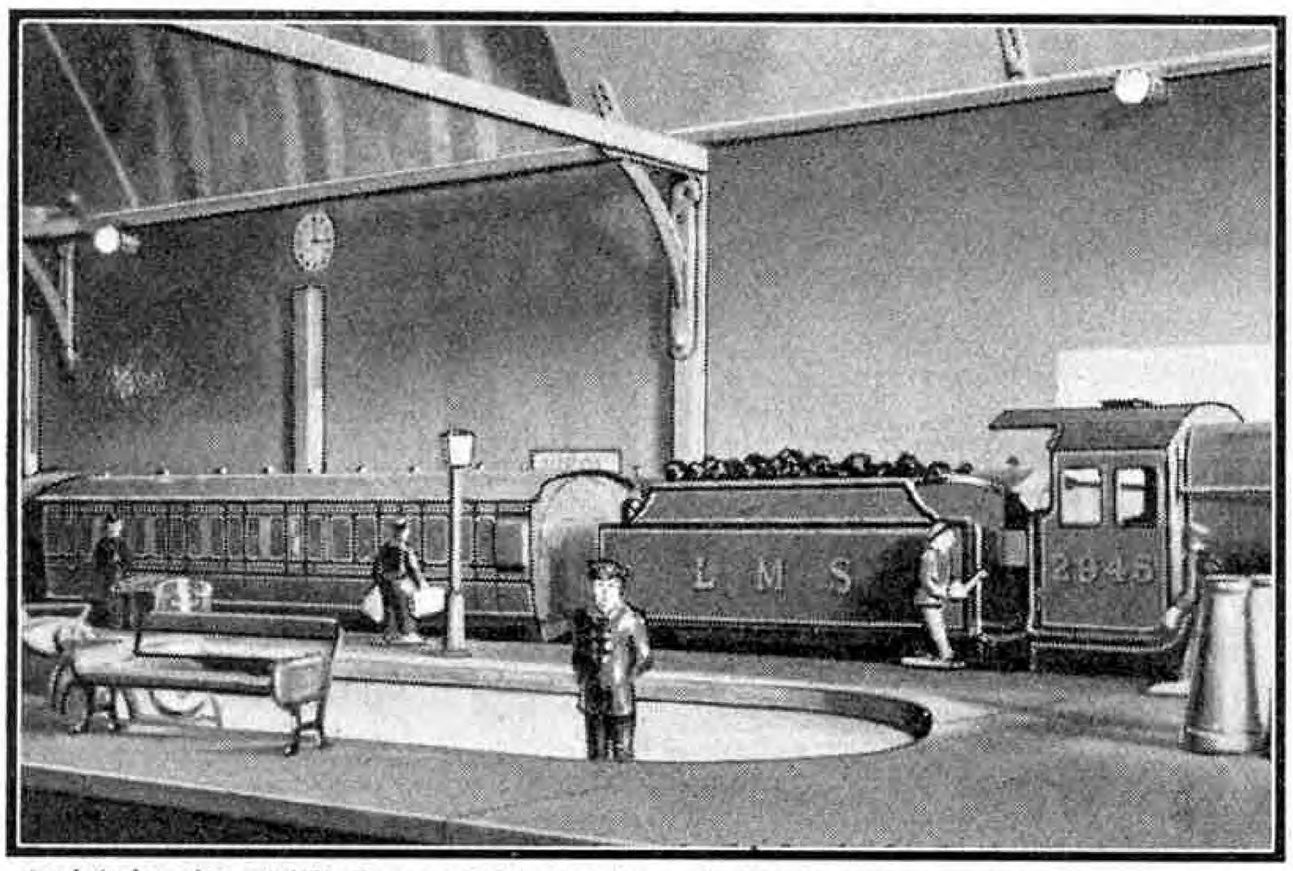
"St. Pancras" Station has been constructed by Branch members and is an imposing structure incorporating five platform faces. Its layout and interior arrangements have exactly the air of the compact full-size station. The widest platform is an island and is of particular interest in incorporating a carriage-way for road vehicles. This feature is plainly visible in the upper illustration on the opposite page. Meccano Parts were largely used in the construction of the roof which, as in the real station, spans the whole building.

From "St. Pancras" the various roads gradually converge with numerous connections at "Brent Junction," where there is a viaduct, incorporating Meccano Girders, which represents the real Brent viaduct. "Brent Junction" is the focal point of the whole system. There goods and locomotive roads join up to the main line, and close by is a locomotive shed and turntable. This shed corresponds to the Cricklewood Motive Power Depot of actual practice, and from the junction the main and "Tilbury" lines diverge. Although the branch is only a short one, "Tilbury" Station includes four roads, with three platform faces; and a scenic background showing docks and marine features is being prepared at this point.

The main line continues from "Brent Junction" to an intermediate station very suitably named "Bedford." This is of the ordinary wayside type, and consists of two standard Hornby Stations, one on each side of the line. The platform of one of these stations is extended by lengths of standard Passenger Platforms. On leaving "Bedford" the line passes under a road bridge, and after a fair length of run through a miniature countryside incorporating hills and fields it sweeps in a continuous curve right round one end of the room, past a spot designated "Wigston," where the line opens out into the platform and goods roads of "Leicester." This station is

arranged as a terminus for convenience in operation, although it is an important through station in real life. Owing to the restrictions of space one platform at each terminal station is reserved for freight traffic.

Traffic on the layout is heavy and is based on the chief passenger and freight services between London and Tilbury and Leicester. Eight operators or controllers at different points are required to carry out a full programme, and each is supplied with a copy of the particular timetable to be worked. The system of working is a good representation of an actual traffic control system, which has been a highly-developed feature of Midland practice for many years. The efficiency of the train running depends largely on the operators at "Brent Junction" and at the main control at "Leicester" respectively, and they are authorised to divert trains from regular routes in any special circumstances or emergencies that may arise.



An interior view at "St. Pancras," showing the main island platform and the central roadway. The various accessories and the Dinky Toys figures give an air of great realism to the scene.

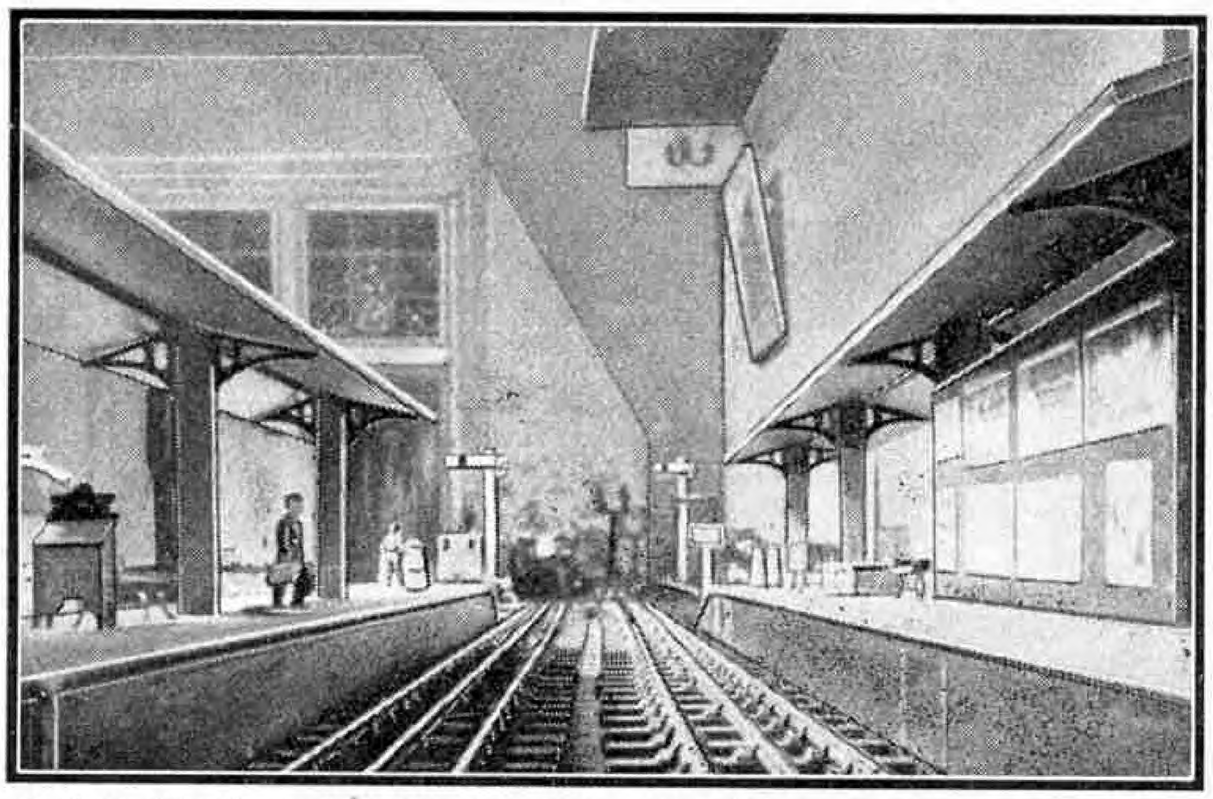
Operators are stationed at the inner ends of the platforms at "St. Pancras," "Leicester" and "Tilbury" respectively. Their work consists chiefly of stopping trains by means of press-button switches, which control special short sections arranged near the buffer stops. These operators also uncouple locomotives from trains that have arrived and, as far as their sections are concerned, they control the commencement of their reversing out of the platform ready for taking out other trains. Movements in platforms and sidings are controlled by operators stationed respectively at the outer end of "St. Pancras," at "Cricklewood" and at "Wigston," near "Leicester," where are situated a locomotive road and a dead-end siding for stock.

Terminal operation is carried out on the principle of having "turn-over" locomotives ready to take out again the trains that arrive. This is a satisfactory arrangement, provided that sufficient engines are available. Thus the engines of arriving trains do not "run round" to take the same trains out again, and after the departure of a train the locomotive that brought it in backs out of the station, and is then ready for its next trip. In the yard at "Cricklewood," however, where freight trains are dealt with, it is possible for arriving engines to run round their trains if necessary.

The frequency of the real Tilbury services, which was referred to in the article by "Railway Engineer" on pages 212-3 last month, is reproduced in a convincing manner on the model system. The miniature "Tilbury" trains run over the same route as the main line trains between "St. Pancras" and "Brent Junction," a slight deviation from real practice, so that this stretch of line is often fully occupied. In fact in certain conditions it is necessary for "reversible" working to be carried out over one stretch of line that is nominally for up trains only, trains then working in either direction as required by the pressure of traffic.

In addition to the regular "Tilbury" services, numerous "Boat Specials" are run from "St. Pancras" and from "Leicester" in connection with imaginary liner sailings from "Tilbury." Trains from "Leicester" to "Tilbury" cannot run direct to their destination, but are necessarily handled via "St. Pancras," where they are worked into the station and then worked out by a fresh engine. Through freight services between "Tilbury" and "Leicester" are operated in a similar manner, except that the "Cricklewood" yard is employed for transfer purposes.

All the more important real main line services of the Midland Division between St. Pancras and Leicester are represented in the working arrangements of the layout, and "Bedford" is naturally provided with a good service of stopping trains in each direction. Long non-stop runs are not possible owing to the restrictions of space, so that the details of the layout have been worked out more for intensive traffic operating of an intermediate character. The standard running allowance for passenger trains between "St. Pancras" and "Leicester" is half a minute, but freight trains of course take longer, and their timing depends on the length of their stay at "Bedford."



"Leicester" Station on the Bedford School Branch layout. There are frequent trains between this station and the other terminus, "St. Pancras," and operations are based on the actual services of the Midland main line of the L.M.S.

The engines in use include a wide selection of Hornby locomotives, both electric and clockwork. Standard Compounds are favourites for main line work, for they are representative of the type of engine that has given splendid service on Midland metals for many years. They are employed on the principal passenger trains, and also on fast freight services, as is evident from the illustration on the opposite page, where one is shown leaving the "goods" side of "St. Pancras" which corresponds to the Somerstown depot of real life. Of the Hornby electrically-driven models, those fitted with automatic reversing motors are particularly popular, as they can be completely controlled from the lineside.



Branch News

WANDSWORTH No. 1 (BALHAM).—Two teams have been formed, and points are awarded at each meeting for good work during track operations. A model town is being built, and the first building erected is a block of flats known as Hornby Court. With the use of Dinky Toys the scheme adds greatly to the realism of the Hornby layout. A permanent Meccano Lift Bridge also is being constructed. A Visit has been paid to Kentish Town L.M.S. Locomotive Sheds, and plans are being made for further out-of-door activities, including rambles, cycling and swimming. The secretary would also be pleased to hear from any London club with a view to arranging a cricket match. There is still room for more members. Secretary: A. H. St. L. Walker, 68a, Oakmead Road, Balham, London, S.W.

SWAN (KIDDERMINSTER).—The Branch track has been relaid and extended. The locomotive stud has been increased, and obsolete rolling stock replaced. Track operations have been resumed, and members are settling down to the use of the new layout. On Games Evenings darts and table tennis are enjoyed. The secretary would be very pleased to hear from enthusiasts in the district and to enrol them. Secretary: A. D. Hamblin, Black Bull Hotel, Swan Street, Kidderminster.

ELMSIDE (EXETER).—Track operations continue with the usual vigour. Regular services are maintained for both passengers and goods, and the general efficiency is well maintained. Frequent "driving tests" in connection with the control of trains are held, and the control of the large volume of traffic exercises the ingenuity of members to the utmost. Dinky Toys Warships have been introduced, and mock battles provided a thrilling diversion. A race across the Atlantic was staged between Dinky Toys giant liners, their movements being governed by a Meccano revolving indicator. Secretary: J. T. Fenwick, 45, Calthorpe Road, Exeter.

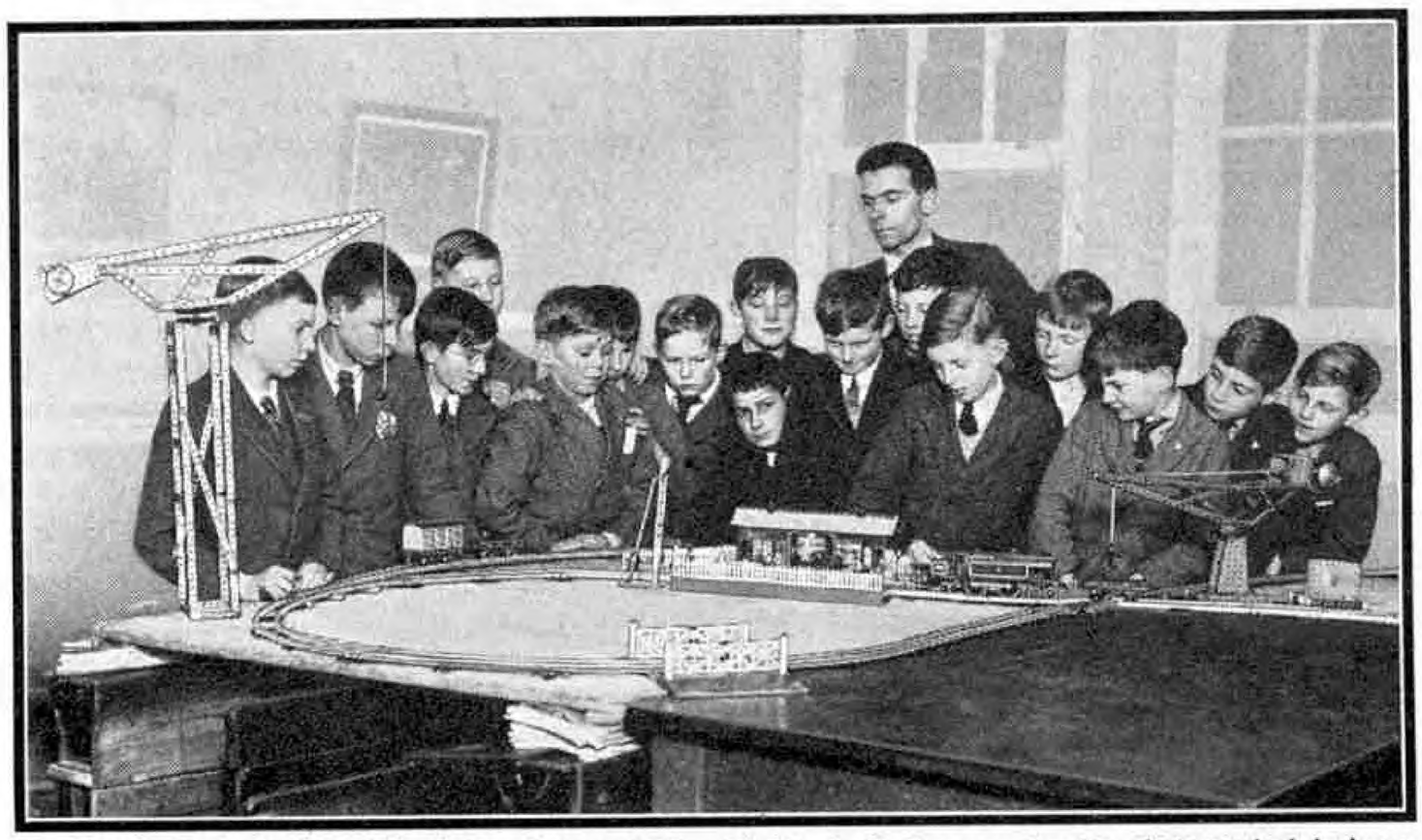
CHORLTON-CUM-HARDY.—Track Nights continue to be interesting. New locomotives are regularly seen in service, heading such trains as *"The Irish Mail," "The Scarborough Flier"* and *"The Flying Scotsman."* A model of an oil factory and further Dinky Toys have been added to the layout, and the station approach has now a very busy appearance. A mechanical coaling plant is under construction. Careful check is kept of the Branch stock, which is very extensive. Secretary: G. H. Gill, 56, Highfield Road, Chorlton-cum-Hardy.

FIRST SHEFFIELD.—From time to time the track is taken up for cleaning and renewal, and is relaid on a different plan, thus providing variety and interest on Track Nights. An electric signalling system has been installed, in which a bell rings to give warning of the approach of trains. Visits of interesting points on L.M.S.R. and L.N.E.R. main lines are made by car, and at Doncaster members saw L.N.E.R. locomotive No. 4497 *"Golden Plover,"* one of the blue "Pacifics." Secretary: W. B. Hutchinson, 35, Linden Avenue, Sheffield, 8.

BARNARD CASTLE SCHOOL.—On re-assembling for the present term it was discovered that Branch resources had been increased, several members bringing new locomotives, rolling stock and other material. A good track was laid down and operated with great success at regular meetings. Members have discussed possible improvements in the layout and in running operations. It is hoped to hold a Visitor's Day in the near future. The Chairman gave an interesting Lecture on various types of locomotives. Secretary: K. R. Southern, Barnard Castle School, Barnard Castle.

LOSTOCK GRALAM.—The track has been electrified. It is modified from time to time in order to give improved train services. Scenic effects are prominent, the Branch having a road system, an airport and a canal as part of the complete layout. Members are constructing a large terminal station and engine sheds. A Debate has been arranged to discuss *"The Respective Advantages of 'O' and 'OO' Gauges for Model Railways."* The Stamp Section has been revived in conjunction with the School Philatelic Society. Secretary: A. Milligan, Wincham Hall, Northwich.

LEATHERHEAD.—A special feature of last session was a two-day track meeting, which proved very popular. Special services were run on a four-track main line, with six locomotives, each train representing a famous express. Other track meetings have been devoted to ordinary timetable running. Secretary: L. G. Lamden, "Coveham," Fir Tree Rd., Leatherhead.



The Hornby Train Section of the Sutton Valence M.C., with Mr. A. G. Freeman, Leader, photographed during a special Meccano and Hornby Train Week, when visitors were invited to special demonstrations. C. Austin, secretary, is second from the right, and H. Horn who is in charge of the Hornby Train Section, is fifth from the left. Photograph by courtesy of the "Kent Messenger."

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given below:

BECKENHAM—J. Hart, 50, Kent House Lane, Beckenham, Kent.
BIRMINGHAM—J. Brittain, 412, Stockfield Road, South Yardley, Birmingham.
BIRMINGHAM—G. Cassidy, 113, Oxford Road, Acocks Green, Birmingham, 22.
BRIGHTON—N. A. Levick, "Northview," 269, Old Shoreham Road, Portslade, Brighton.
BULKINGTON—R. Tarling, "Wridan," Nuneaton Road, Bulkington, Nr. Nuneaton.
CRADLEY HEATH—C. Brindle, 183, High Street, Cradley Heath, Staffs.
LEEDS—R. Nunwick, 6, Park Gate Crescent, Guiseley, Leeds.
LIVERPOOL—D. Cail, 6, Beach Bank, Waterloo, Liverpool.
SALTBURN-BY-SEA—P. Toyer, 5, Ruskin Avenue, Saltburn-by-Sea.
SOUTHAMPTON—F. W. J. Davies, 42, West End Road, Bitterne, Southampton.
ST. ANNES-ON-SEA—J. T. Howe, 86, Clifton Drive South, St. Annes-on-Sea.

H.R.C. COMPETITION PAGE

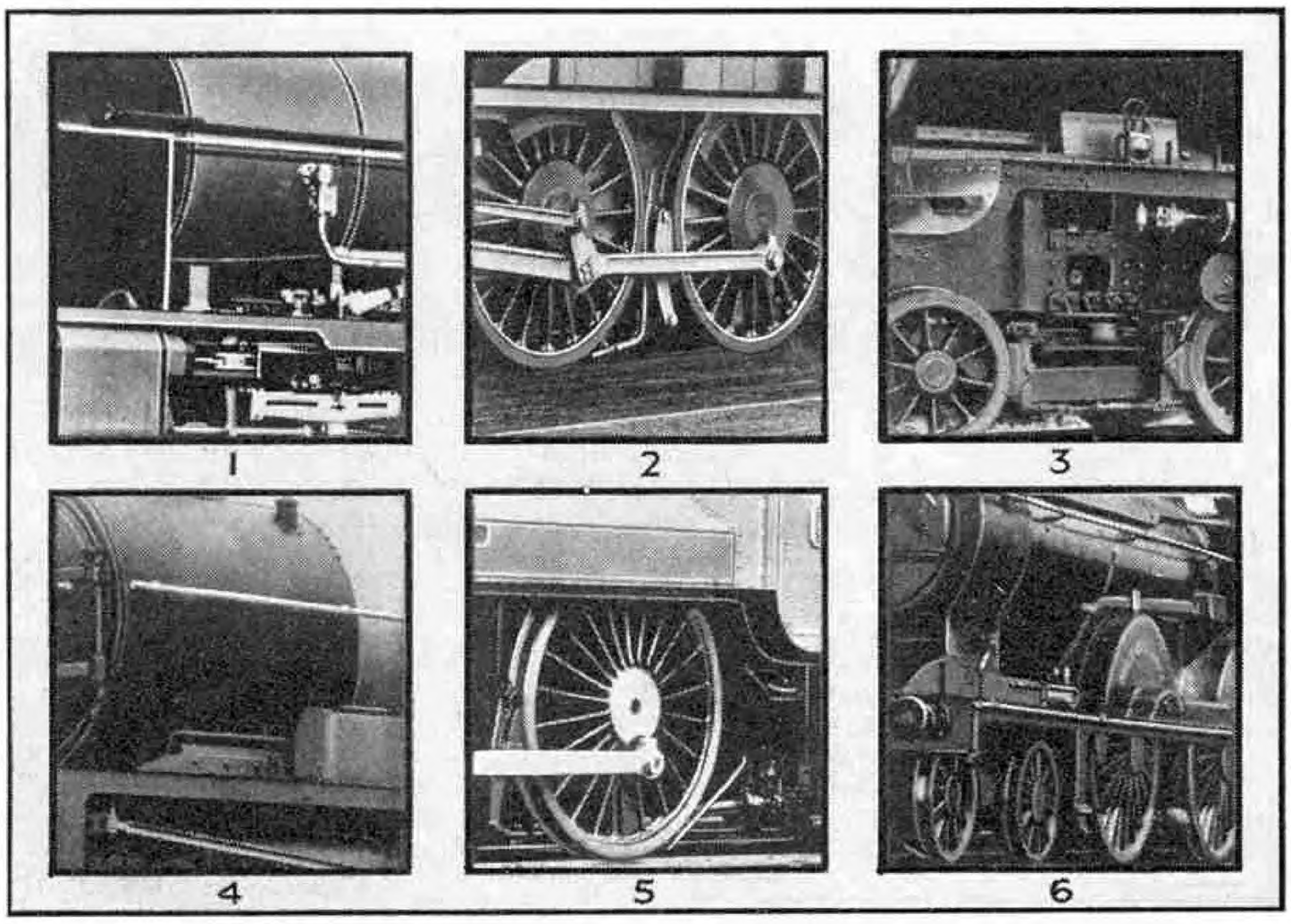
Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

AN INTERESTING LOCOMOTIVE PROBLEM

On each of the four British Railways there are classes of locomotives that closely resemble each other in external detail. The engines of these classes have special features of design, perhaps of a minor kind, that enable enthusiasts to distinguish between them, however. An example of this is provided by the "Royal Scot" and "Patriot" classes of the L.M.S. These are almost identical in general external design, but the "Patriots" have smaller boilers than the "Royal Scots."

Practically all H.R.C. members will be able to think of other locomotive classes with similar general resemblances, and differences in certain details, and it is with some of these that our contest this month is concerned. The illustration on this page shows portions of six well-known British locomotives. Each of the engines represented could at first glance be taken for one of another class of the same railway, but for some special features that definitely "place" it. At least one of these features is shown on each of the six illustrations, and with these as guides members are asked to identify the classes to which the engines belong. In addition to the class, competitors are required to name the owning company of each locomotive, to give the wheel arrangement, and to specify the feature or features that led to the recognition of the class represented.



To the competitor in each of the two sections, Home and Overseas, who sends in the most accurate solution, Hornby Train material or any product manufactured by Meccano Ltd., to the value of 21/– will be awarded; and to the senders of the two entries next in order of merit similar goods to the value of 15/– and 10/6 respectively. In the case of a tie, neatness and general presentation will be the deciding factors.

Entries should be marked *"H.R.C. May Locomotive Competition"* and posted to reach Headquarters, Meccano Ltd., Binns Road, Liverpool 13, on or before 31st May. The closing date for the Overseas section is 31st August.

Railway Photographic Contest No. 2

Last month saw the opening of our summer series of Photographic Contests, in which members are asked to submit photographs of any railway subject. This month we announce the second of these contests. For the benefit of new members we repeat that there are no restrictions in regard to the subject chosen, but the actual exposure must have been made by the competitor himself. The developing and printing may be the work of a professional. A short description of the subject of the photograph should be given on the back of each print submitted, together with the competitor's name, H.R.C. membership number and full postal address. Competitors may send in as many prints as they desire, but no competitor can win more than one prize in one contest. Entries will be judged on their railway interest as well as their pictorial value and technical merit.

The contest will be divided as usual into two sections, Home and Overseas, and prizes of photographic material if desired or any products manufactured by Meccano Ltd., to the respective values of 21/–, 15/– and 10/6 will be awarded to the senders of the best photographs submitted in each section. Unsuccessful entries will be returned provided that a stamped addressed envelope of sufficient size is enclosed. It should be noted, however, that entries gaining awards become the property of Meccano Ltd., and will not be returned.

Envelopes containing prints should be clearly marked *"H.R.C. Photo Contest No. 2"* in the top left hand corner, and should be posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, not later than 31st May. The closing date for the Overseas section is 31st August. Competitors will be well advised to make a careful note of the closing dates of the contest, as entries received late cannot be passed on to the judges. Members should also take care to ensure that their name and address are clearly written on each photograph submitted, as numbers of entries are still sent in each month which do not bear the sender's name and address.

COMPETITION RESULTS

HOME

February "Loco Faces Contest."—First: D. COAKHAM (28368), Upper Rathmines, Dublin, I.F.S. Second: C. E. WRAYFORD (6039), Bovey Tracey, Devon. Third: C. DICKER (55679), Burgess Hill, Sussex. Consolation Prizes: K. COSTAIN (5108), Bolton, Lancs.; L. J. SLATER (49094), Cosham, Portsmouth, Hants.; B. MILLER (47648), Liversedge, Yorks.; J. L. MAKIN (30933), Allestree, Derby; T. M. CHARLTON (47059), Doncaster, Yorks.; K. J. FISHER (45472), Bournemouth, Hants.

February "Articles Suggestions Contest."—First: M. HOSKINS (16653), Exeter, Devon. Second: E. C. PEART (50953), Hollinwood, Oldham. Third: R. A. BRIARS (53902), Newbury, Berks. Consolation Prizes: L. J. SLATER (49094), Cosham, Portsmouth, Hants.; N. NOWNE (54350), West Croydon, Surrey; F. H. C. HEMSLEY (54891), Dunbar, E. Lothian; W. WHITAKER (44565), Southgate, Hornsea, E. Yorks.

OVERSEAS

November "Photo Voting Contest."—First: A. R. BACON (38242), Bycula, Bombay, India. Second: E. KEWNEY (49052), Natal, South Africa. Third: J. FABRIE (30032), Maastricht, Holland. Consolation Prizes: F. L. BINGEN (28995), Maastricht, Holland; D. MURISON (37642), Buenos Aires, South America; H. BENNETT (10615), Auckland, S.W.1, New Zealand; L. JOHNSON (53248), New South Wales, Australia; W. S. EAGLE (31779), Byculla, Bombay, India.

November "Layout Planning Contest."—First: R. MYBURGH (37538), Cape Province, South Africa. Second: L. A. S. JOHNSON (53248), New South Wales, Australia. Third: D. MURISON (37642), Buenos Aires, South America.

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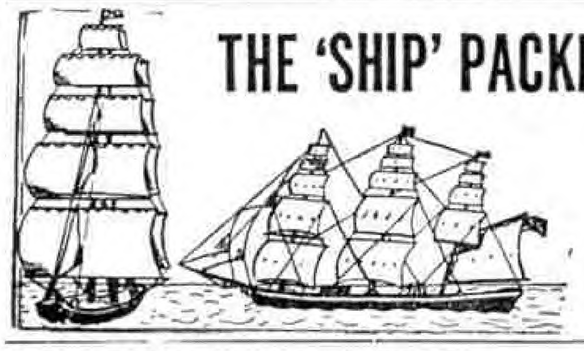
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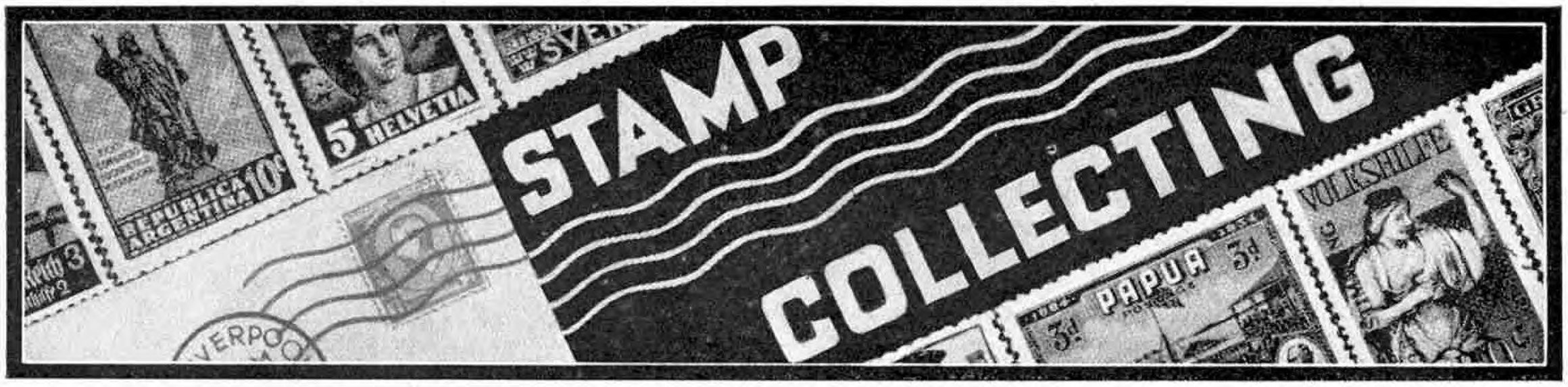
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ITALIAN ART AND MUSIC CENTENARIES

ONE of the most interesting of recent Italian stamp series marks a group of centenaries of famous figures in Italian art and music. The series consists of 10 stamps, which between them commemorate five great personalities, Giotto, Leopardi, Pergolesi, Spontini and Stradivari. There are five different designs, and an illustration of each of these appears on this page.

The most romantic figure of the five is Antonio Stradivari (1644-1737), the greatest violin-maker the world has known, who on the 20c. and 2 L 55 stamps is shown sitting in his workshop at Cremona, applying the finishing touches to one of his creations. It was from these finishing touches and particularly from some peculiar quality of the varnish he used that Stradivari's instruments derived their amazing perfection of tone.





The secret of the varnish died with him and has since defied discovery by all the experts who have tried to find it. Small wonder then that the dream of every violinist's life is to possess a "Strad." They rarely come into the market, nowadays, and then command very high prices.

The 30c. and 75c. stamps show a bust of the musician Giovanni Pergolesi (1710-1736). Pergolesi's early work promised a career of unparalleled brilliance, and his death at the age of 26 was one of the greatest tragedies the world of music has known.

Gasparo Spontini, whose portrait is shown on the 10c. and 1 L 75 values, also was a famous musician. Spontini was born in 1774 and died in 1851, and although there is no doubt that this is the Spontini to whom the stamps pay honour, it is a little difficult to reconcile these dates with the inscription "Centenario di Spontini" on the stamps!



Spontini was the son of a cobbler and his parents intended him for the priesthood. Music claimed him, however, and so brilliant was his career that he became Director of the Italian Opera House at Milan at the age of 36. He had a rather stormy temperament, and following disputes he gave up the appointment, only to resume it in 1814. Six years later he again resigned and went to settle in Berlin. Later still he moved on to Paris, where he composed *"La Vestale,"* a work that is considered by many to be his greatest achievement.

Giotto (1267-1337), shown on the 1 L 25 and 2 L 75 stamps, was a painter and his greatest works were mural pieces and altar decorations, depicting the life and miracles of St. Francis, that are to be found in various Italian cathedrals. He broke completely away from tradition and his work possessed such character and force that he is often described as "the first great humaniser of painting."

Several stories are told of his skill. One is that his first inclinations toward art were shown by his drawing a portrait of one of his father's sheep on a smooth rock with a sharp stone. Another relates how, when Pope Benedict XI desired proof of his skill before entrusting him with a commission, he took up his brush and with one sweep painted a capital letter "O" of such simple beauty that the Pope desired no further demonstration.

The fifth portrait is that of Giacomo Leopardi (1798-1837), shown on the 25c. and 50c. values. Leopardi is known as "the melancholy poet of perfect style." He showed early signs of brilliance and his first works were published when he was only 16 years of age. In 1819 he produced a series of great odes to Italy. He was a great admirer of the works of Dante, and many of his greatest poems were in praise of the early master. Leopardi's portrait, in fact, was one of those chosen for inclusion in the Dante Alighieri Society commemorative series of stamps issued by Italy in 1932, and appeared on the 50c. value of that issue.



This series serves the interesting purpose of directing attention to the splendid range of portraits of famous figures of music and art to be found on stamps. There is not space to deal in detail with such a portrait gallery this month, but those of our readers who are interested in these directions would find it a very fascinating pursuit to seek to build up a complete portrait gallery in their own favourite subject.



To take music as an example, almost all the famous composers of bygone days are represented. The earliest composer we can find is Heinrich Schutz (1585-1672) who is often referred to as the "father of German music." He is shown on the 6 pf. of the German Musicians series of 1935. The same series contained portraits of Bach (1685-1750), on the 12 pf. stamp, and of Handel (1685-1759), composer of the great oratorio *"Messiah,"* on the 25pf. stamp. Bach also appears on the 50 pf. of Germany's 1926 issue, from which series a portrait of Beethoven (1770-1827) can also be obtained.

Austria provides another portrait of Beethoven on the 7½ kr. value of the 1922 Musicians series. This set featured seven different famous Austrian composers, the other six being: 2½ kr., Haydn; 10 kr., Schubert; 25 kr., Bruckner; 50 kr., Johann Strauss and 100 kr., Wolf.

A portrait of Liszt (1811-1886), the great Hungarian musician, appears on the 20 f. value of Hungary's 1932 series. Paderewski, the great pianist and composer, who became the first President of his native Poland, is seen on the 15 f. value of Poland's 1919 series, and Poland also commemorated Frederic Chopin (1809-1849) on a 40 gr. stamp issued in March 1927. Other portraits that come to mind are those of Smetana (1825-1884) and Dvorak (1841-1904), both of whom were shown on stamps issued by Czecho-Slovakia in 1934.
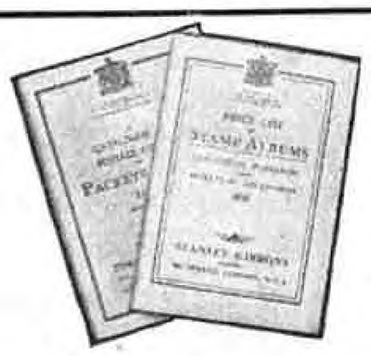
If it is desired to enlarge the collection to include all stamps having musical associations, the scope becomes exceedingly wide. Typical material of this nature would be the Austrian (1926) and German (1933) series showing incidents from the Nibelung legends and from the famous operas that Wagner based on those legends, including *"Tannhauser," "The Flying Dutchman," "Rhinegold," "The Mastersingers," "The Valkyries," "Siegfried," "Tristan and Isolde," "Lohengrin,"* and *"Parsifal,"* all of which are shown on the German set.

Another side line to the collection would be the inclusion of stamps featuring pieces of music, or having direct associations with famous songs. Among such items that come to mind immediately are Brazil's Carlos Gomes centenary issue of 1936, the design of the 700 r. value of which shows the opening bars of *"Il Guarany,"* the Brazilian national song.

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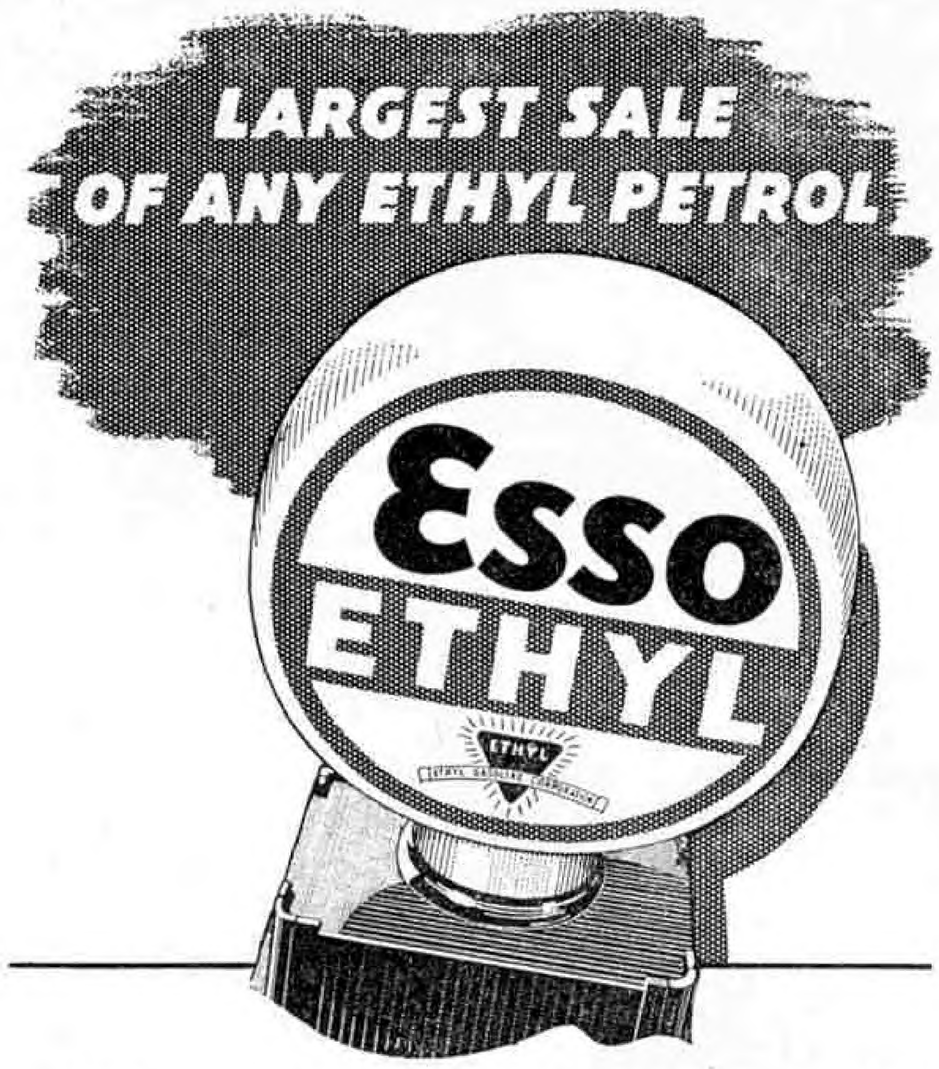


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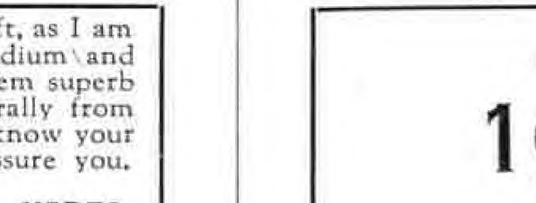


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Stamp Gossip

and Notes on New Issues



King George VI Colonial Issues

This month we illustrate further specimens from the new King George VI Colonial issues, the most interesting of the new designs being, perhaps, the Gibraltar 2d. value



showing a view of Victoria Gardens and the North Side of the famous rock.

Nine new stamps have been added to complete the British Honduras series to which reference was made in our article last month. We illustrate the 1c. value, showing a group of Maya figures. The other designs are as follows: 2c., chicle tapping. Chicle is the principal ingredient in chewing gum; 10c., mahogany logs in river; 15c., Sergeants Cay; 25c., dorey boat; 50c., typical scene in chicle industry; $1, Court House, Belize; $2, felling mahogany trees; $5, King George VI and badge of Colony.

Following this issue, it has been announced that the stamps bearing the head of King George V are to be withdrawn from circulation and demonetised on 31st May.



St. Vincent has issued a complete series of 11 stamps with five designs. The allegorical design shown here, featuring the figures of Peace and Justice, is an adaptation of the Colony's badge and is used for seven of the new stamps. The other designs show views in the colony as follows: 1½d., Kingstown and Fort Charlotte; 1d., Young's Island and Fort Duvernette; 2½d., bathing beach at Villa; 1/–, Victoria Park, Kingstown.

Mauritius, which also has issued a series of 11 values, has retained the old type King's Head design, with the substitution of the portrait of King George VI.

Both Basutoland and Bechuanaland have retained their respective single pictorial designs for their new issues, with of course the substitution of the new King's portrait.

The Swaziland Protectorate also has retained the main features of the single pictorial design issued during the reign of King George V. In addition to the substitution of the portrait of King George VI, however, the name labels that previously flanked the Crown immediately above the King's head have been omitted, and the word "Swaziland now runs in place of the word "Protectorate" in a panel immediately below the portrait.

Stamp Voting Contest Results

Readers who took part in the Stamp Voting Contest announced in our issue for December last will be interested to see the results of the voting and to compare them with their own entries.

In the Home Section the final order of popularity was as follows: No. 5, No. 2, No. 10, No. 1, No. 7, No. 4, No. 8, No. 3, No. 6, No. 9. In the Overseas Section the results of the voting were rather different, the final order being as follows: No. 2, Nos. 1 and 10 equal, No. 7, No. 5, Nos. 3 and 4 equal, Nos. 8 and 9 equal, No. 6.

In the Overseas Section no competitor succeeded in giving a completely accurate forecast of this order, and the prizes were awarded as follows: 1. R. and G. Myburgh (Claremont, S. Africa); 2. P. Shirtliff (Westport, N.Z.); 3. R. Holloway (Hawera, N.Z.); 4. H. B. Horwitz (Ottawa). Consolation Prizes: W. Carpinter (Christchurch, N.Z.); G. E. Philpott (N. Canterbury).

The awards in the Home Section were announced in the February issue.

Glasgow Empire Exhibition

Readers who visit the Empire Exhibition, which opens at Bellahouston Park, Glasgow, this month, should make a point of visiting the G.P.O. Pavilion, where the Post Office's permanent stamp exhibit will be on view. This exhibit, which has been shown previously in places as far apart as London, Melbourne, New York and Vienna, contains a most fascinating range of philatelic material tracing the story of British postage stamps from the "Penny Black" up to modern times.

This display will not be the only item in the G.P.O. pavilion, of course. There will be a host of other exhibits depicting the full range of activities of the British Post Office. Stamp collecting readers would find this exhibit alone sufficient attraction to justify a visit to this great Exhibition.

Stamps of the Empire

T. Todd. (Nelson. 3/6)

Anyone who attempts a comprehensive survey of the stamps of the British Empire in the confines of a 200-page book is deserving of encouragement. Mr. Todd, who will be known to many of our readers as the Editor of *"The Stamp Magazine,"* has produced a very interesting book, in which he has brought together a mass of interesting historical facts and anecdotes concerning almost every outstanding stamp that the Empire has produced. The whole makes up into a cheery volume that will appeal to all young stamp collectors.

Australia's Koala Stamp

One of the most interesting Australian issues of recent years is the 4d. value, issued in February, illustrating the popular Koala. This is Australia's only native bear, and its decidedly amusing appearance and novel characteristics have made it a great favourite with children.



The design of the stamp shows the Koala in a characteristic pose, for it lives in trees and ventures to the ground only on rare occasions. On those occasions, if approached, it will scramble very quickly up another tree to safety. Its diet consists principally of the new shoots and leaves of the gum tree.

Balkan Entente Commemoratives

The recent formation of an alliance between Greece, Jugoslavia, Rumania and Turkey is being celebrated in those countries by the issue of special stamps.



We illustrate here the designs issued in Greece and Rumania. They provide a most remarkable example of how two different stamp designers, employing identical material and laying it out in the same way, can achieve widely differing effects.



Careful examination of the two stamps will show that they are identical in all their features except the word "postage," present on the Rumanian stamp, but omitted from the Greek issue. The main feature of both stamps is the group of shields bearing the arms of the four countries. In the Greek stamp, the Greek arms are uppermost, while in the Rumanian stamp, the Rumanian arms take pride of place.

Belgian Parcel Post Issue

Railway enthusiasts among our readers will be specially interested in the illustration here of the design for a new Belgian series of parcels post stamps. The winged wheel and simple piece of steel rail create a singularly effective impression of great speed. Note the posthorn in the bottom left corner.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

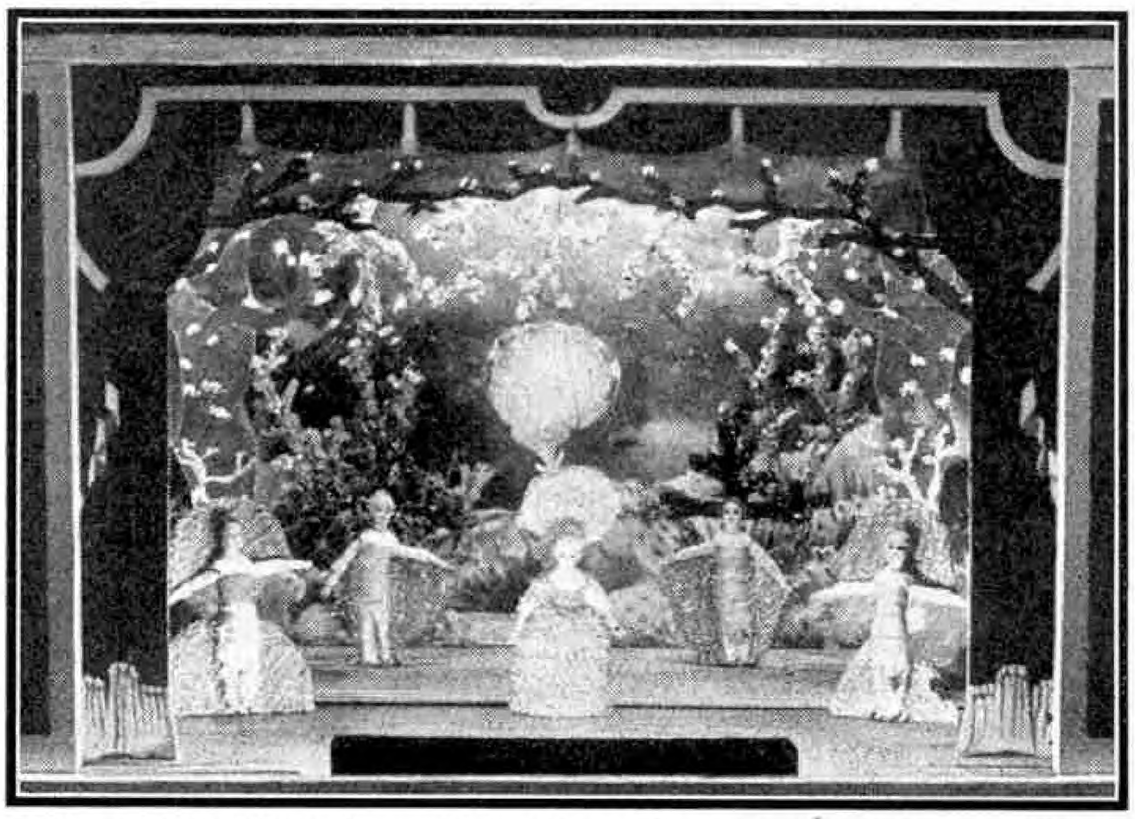
A Home Made Puppet Theatre

Scenes Set in Advance on Sliding Stages

By E. J. Burrell

ONE of the most fascinating hobbies in the world is the construction of puppet theatres. These give splendid opportunities for design and constructional work, and when they are finished it is great fun to perform plays in them, suiting the movements of the tiny figures to the action and words of suitable plays. The owners of such theatres often write their own plays or versions of well-known stories, as well as produce them, and a miniature theatre also lends itself well to lighting and scenic effects of all kinds.

The illustrations on this page show front and back views of a puppet theatre constructed by Mr. C. V. Heap, Buckhurst Hill, Essex. Mr. Heap actually owned his first puppet theatre when he was about 10 years old, and at the age of 14 he and his brother designed a model for themselves, basing it on experience they had gained with earlier and rather flimsy toys. They were given a little assistance from the local carpenter in building the framework, and the theatre they then constructed is still used by Mr. Heap to present plays that he writes and produces with the sole assistance of Mrs. Heap. Everything about the theatre is home made, and Mr. Heap now has puppet characters and properties for five complete plays of 12 scenes each. He writes the dialogue, makes and paints the scenery and other properties, and dresses the characters. He and his wife work the puppets and speak the lines, and incidental music of a suitable character for the plays is provided by means of gramophone records.



A fairy grotto that forms the conclusion of a transformation scene in the puppet theatre of Mr. C. V. Heap that is described in the accompanying article.

Mr. Heap's theatre can be erected in a suitable room in about two hours, the necessary back stage being sectioned off by means of curtains hung on a special framework of light cane. The stage is about 3 ft. wide and 2 ft. 6 in. high, with a depth front to back of 3 ft. The actual front opening measures 2 ft. by 1 ft. 6 in. Scenes are set on sliding stages that normally are on a level with a fixed front section, but in the upper illustration on this page the sliding stage has been raised slightly so that its edge shows as a dark line.

There are six of these stages, which are made of plywood and rigidly battened, with slots on each side to take the scenery. When a play is being presented the scenes are set on them in advance, so that they can be slipped complete into the main framework from one side or the other. This method allows rapid changes to be made, the most elaborate ones occupying only the time required to play about half of a 10-inch gramophone record.



Mr. Heap setting up the stage for a performance of his latest play. The "actors" are hung up at the side in readiness for their cues.

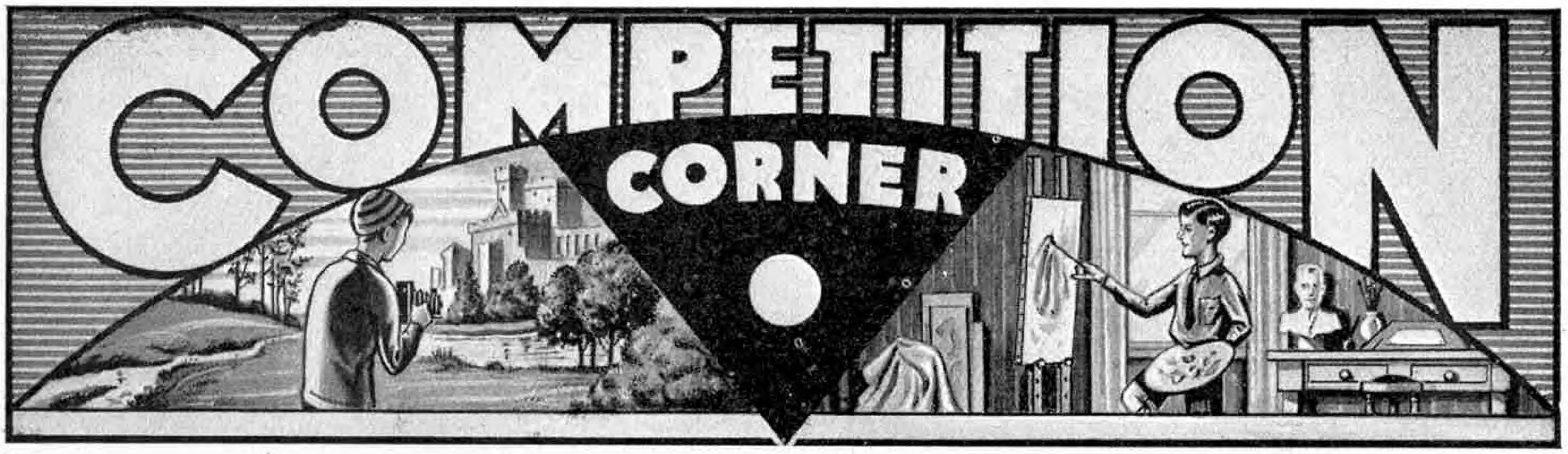
Mr. Heap does not believe in very elaborate stage effects, for he thinks that these may defeat their own ends by drawing attention to themselves instead of the story. For this reason most of the puppets are moved by only one wire, which is fixed firmly at the back of their heads. They are made from small cheap dolls that are pulled to pieces and remade in good proportion and about 4½ in. in height, with joints loose enough to give them sufficient movement. For special purposes extra wires are attached to the arms or legs of certain puppets, so that their limbs can be moved separately, and others are made with very loose joints so that with proper handling they can be made to dance.

Effective lighting plays a great part in the presentation of the plays. The lamps used are of various colours, and are fitted with 4-volt bulbs supplied with current from the mains through a transformer. The lamps are controlled from a switchboard behind the stage, on which are variable resistances to allow fading, and a mains switch by means of which all the lamps in circuit can be switched on suddenly. There is a small board below the stage for the control of the footlights, and a spare switch is provided for special lights required in certain scenes, such as those needed to give a glow to the summit of a volcano that forms part of the scenery in one of Mr. Heap's plays.

The lighting arrangements are particularly valuable in devising transformation scenes. One of these begins as an open stretch of the sea bed, with a dark cavern in the background in which lurks an octopus—once a harmless white glove!—that is duly vanquished by the diver hero after a terrible fight. Various small changes are made as the scene progresses, and finally a glittering lattice closes in from top and sides to produce the fairy grotto scene in our upper illustration, in which a magic pearl is discovered. In this scene dim green lighting seen through a green gauze curtain is gradually built up to full white, with the magic pearl itself lighting up its golden shell.

Splendid effects are obtained by Mr. Heap by careful timing of the movements of his simple puppets. An example of this is given in "*The Queen of Hearts*," Mr. Heap's latest pantomime, in which there are 22 named characters; some of the principals have three or four changes of costume, so that altogether 50 puppets are called for. In one scene the hero is about to leave by stage coach on a snowy Christmas Eve. The coach comes on and farewells are spoken just as the snow begins to fall, and the curtain drops at the very last moment as the hero turns to enter the coach. With more elaborate arrangements he could have been shown to get inside the coach, but the precision of handling during the last few moments and careful timing of the curtain bring the scene to a far more effective close on the last spoken words than if it ended with a mechanical movement, however ingenious, made in silence.

Colour lighting adds greatly to the effectiveness of many scenes, and I asked Mr. Heap if he could fade direct from one colour to another without dimming. He explained that he had considered this, but found that the need for it could be avoided by properly planning his effects.



A CRICKET VOTING CONTEST—ENGLAND'S BEST TEST XI

The outstanding feature of the cricket season that has just opened will be the presence of the Australians, the holders of the mythical "Ashes." The English team selectors have no easy task in trying to find a team good enough to win those "Ashes" back for England. Most of our readers are as keenly interested in the choice of the English team as the selectors themselves, and probably feel they could make as good a job of it themselves. Well, here is a chance, for we are inviting all our readers to nominate an English team to meet the Australians in the first Test Match at Nottingham commencing on 10th June. Prizes of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the readers whose teams most nearly correspond with the side finally chosen to represent England.

Between now and the closing date, readers should study carefully the form and claims of all the possible members of the side. The selectors will be guided by the current season's form and readers should study the early season form of all the likely players.



The Problem. A charming picture by Mr. J. R. Tottle, Taunton, submitted in the 1937 Photo Contests.

In the event of more than one competitor giving the correct side, the prizes will be awarded to the entries showing the neatest or most novel preparation.

Entries for this contest must be addressed "*Test XI Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 28th May. Competitors should make a special note of this date, which is a few days in advance of the usual time.

As most of our Overseas readers are keenly interested in this Test series, there will be an Overseas Section to this contest in which contestants are asked to select the English team for the fifth Test Match, to commence at Kennington Oval, London, on 20th August. The closing date in this section will be 30th July except for Australian and New Zealand competitors for whom the closing date will be 31st August.

Overseas competitors should take care to send in their selection in good time, for entries posted after the official team has been announced will be disqualified.

May Photo Contest

As announced in the April "*M.M.*," we are holding a photographic contest each month throughout this summer. The conditions of the competitions are exceptionally simple, and are designed to make it possible for every reader to take part. The only requirements are that the exposure must have been made by the competitor himself and each print must bear a title.

Each month's entries will be divided into two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products or photographic material, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section.

Entries to this month's competition should be addressed "*May Photo Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 31st May. Overseas closing date, 31st August.

Competition Closing Dates

HOME	
Test XI Voting Contest	**28th May**
May Photo Contest	**31st May**
OVERSEAS	
"Animalesques" Contest	**31st May**
February Drawing Contest	**31st May**
March Drawing Contest	**30th June**
March Crossword Puzzle	**30th June**
"Golfwords" Contest	**30th July**
April Photo Contest	**30th July**
Test XI Voting Contest	**30th July**
Test XI Voting Contest ... ... (Australia and New Zealand only)	**31st August**
May Photo Contest	**31st August**

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group, as age allowances are given to ensure equality of opportunity for the younger competitors.

COMPETITION RESULTS

HOME

"February Drawing" Contest.—First Prizes: Section A, F. MILLS (Kearsley); Section B, G. WHALLEY (Nottingham). Second Prizes: Section A, F. C. BENT (Disley); Section B, J. LAING (Dunstable).

"February Animalesques" Contest.—1. J. W. BRIDGMENT (Hunstanton). 2. A. L. DAVIES (London). 3. R. W. MUNRO (Motherwell). 4. T. J. WALKER (Sutton).

"March Crossword Puzzle" Contest.—1. A. NEW (New Barnet); 2. C. J. LYNCH (Clifton, York); 3. E. MAUDE (Leeds); 4. M. CORMACK (Liverpool 14).

"March Drawing" Contest.—First Prizes: Section A, C. BOWLES (Grimsby); Section B, D. DUERDEN (Nelson); Second Prizes: Section A, J. E. BURLEY (Birmingham, 6); Section B, J. LAING (Dunstable).

OVERSEAS

"November Hidden Proverbs" Contest.—1. R. J. HILL (Vancouver). 2. N. THOMSON (Capetown); 3. J. A. RODRIGUEZ (Montreal); 4. B. E. HARRISON (Victoria); Consolation Prize: E. KEWNEY (Natal).

"November Drawing" Contest.—First Prizes: Section A, S. D. KURLAWALLA (Bombay); Section B, B. J. DICKISON (Dunedin); Second Prizes: Section A, Miss V. GALEA (Valletta, Malta); Section B, T. P. MORRIS (Salisbury, S. Africa).



MISUNDERSTOOD

Convict: "When does the fun begin?"
Warder: "Fun? What fun?"
Convict: "Well, the judge said I was to come here for the time of my life."

* * * *

Sandy had learned that a specialist he intended to consult charged three guineas for the first visit and 10/6 for each succeeding visit. So he stalked confidently into the consulting room and banged 10/6 on the table.

"Hello. doctor," he jovially exclaimed, "here I am again!"

"Well, well," said the specialist, as he pocketed the money, "just carry on with the same prescription as before."

* * * *

Corporal: "The general was quite provoked this morning."
Lance-corporal: "What about?"
Corporal: "He received a letter marked 'Private.'"

* * * *

Dad: "You get more pocket-money in a week than I got in a month."
Son: "Well, don't grumble to me about it. Go and have it out with grandfather."

* * * *

Bones: "Rastus, why am yuh paintin' de fence so fast?"
Rastus: "Boh, I'se tryin' to do it before de paint runs out!"

* * * *

"How did you become an aviator?"
"I began at the bottom and worked my way up."

* * * *

Teacher: "If you have ten shillings in one pocket and fifteen in the other, what have you?"
Pupil: "The wrong trousers, sir."

* * * *

First Salesman: "What do you sell?"
Second Salesman: "Salt."
First: "Why, I'm a seller, too!"
Second: "Shake!"

* * * *

Teacher: "Why were you not at school yesterday, Bobbie?"
Bobbie: "Please, sir, I was convalescing."
Teacher: "Convalescing? What from?"
Bobbie: "Three apple dumplings and one of father's cigars."

* * * *

Mother: "What are you looking for?"
Small Son: "Nothing."
Mother: "You'll find it in the box where the chocolates were."

* * * *

Tommy: "A cake of soap, please."
Grocer: "Do you want it scented?"
Tommy: "No, I'll take it with me."

* * * *

NOT THERE AT THE TIME



Rastus: "Doesn't that mule ever kick you?"
Sam: "No, sah, but he frequently kicks de place where Ah recently was."

ALARMING

Bill Smith, country storekeeper, went to market to buy a stock of goods. The goods were forwarded immediately and arrived before Bill.

As his wife looked at the largest box she uttered a piercing shriek. A neighbour, coming to her assistance, asked what was the trouble.

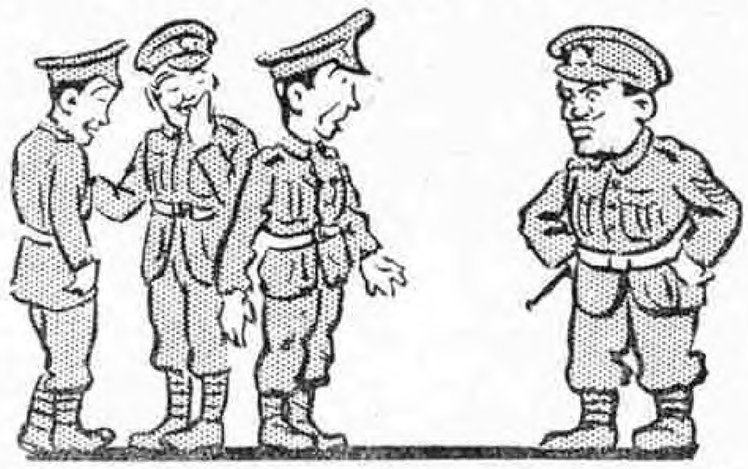
Pale and trembling, Mrs. Smith pointed to the notice on the box lid: "Bill Inside."

* * * *

Judge: "You stole no chickens?"
Suspect: "No, sir."
Judge: "No geese?"
Suspect: "No, sir."
Judge: "Any turkeys?"
Suspect: "No, sir."
Judge: "Case dismissed."
Suspect (grinning): "Judge, I sure was scared you'd say ducks."

* * * *

A SLIGHT MISAPPREHENSION!



Sergeant: "Any of you men got a dirty uniform?"
Private (hoping for new tunic): "Yes, sergeant, look at me."
Sergeant: "You'll do. Report to-morrow morning at 6.30 for coal shovelling!"

* * * *

Box Office Clerk: "Yes, sir, we have plenty of good seats."
Inquirer: "That's unfortunate."
Box Office Clerk: "Why?"
Inquirer: "I wrote the play."

* * * *

A man seeing the notice, "Iron Sinks" in a shop window, went inside and said that he was perfectly aware that "iron sinks." Alive to the occasion, the shopkeeper retaliated: "Yes, I know, and time flies, but wine vaults. Also sulphur springs, jam rolls, grass slopes, music stands, moonlight walks, rubber tires, and the organ stops."

"Quite true," agreed the wag. "But you have forgotten one thing."

"What's that?" asked the shopkeeper.

"Marble busts," replied the visitor as he bowed himself out of the door.

* * * *

Navvy: "I dug this hole where I was told to, and the following day I put the earth back as per instructions. But it won't all go back in. What'll I do?"

Irish Foreman (after consideration): "There's only one thing to do—you'll have to dig the hole deeper."

* * * *

The foreman of an electrical repair shop was interviewing a boy applying for a job.

"Do you know anything about electrical apparatus?" asked the foreman.

"Yes, was the reply."

"What is an armature?" asked the foreman.

"A football player who doesn't get paid," replied the boy.

* * * *

THIS MONTH'S HOWLER

Imports are ports far inland.

MORE DETAILS WANTED

Diner (having altered his order for the third time): "I think, after all, I'd rather have cutlets, and make them lean."

Fed-up Waiter: "Yes, sir, lean which way, sir?"

* * * *

Sam: "I want to get into some business where I am sure to get a foothold."

Dan: "That's easy. Become a chiropodist."

* * * *

Schoolmaster: "If you do not improve, Smith, I will ask your father to call and see me."

Smith (a doctor's son): "I shouldn't do that, sir, he charges half a guinea a visit."

* * * *

"Brown hasn't had a hair cut for 10 years."
"He must be mad."
"No, only bald."

* * * *

Tim: "When have elephants eight feet?"
Jim: "I'll buy it."
Tim: "When there are two of them."

* * * *

Tommy, aged 14, set out to get a job. His first call was at an engineering works.

"What can you do, sonny?" asked the foreman.

"Anything," replied Tommy.

"Can you file smoke?" asked the foreman, thinking to catch the youngster.

"Yes, sir," replied Tommy, without hesitation. "If you'll grip it in a vice for me."

* * * *

"Your son must be a very fast runner, George," said Farmer Brown to his foreman. "The newspapers say that he fair burnt up the track at the sports meeting yesterday."

"Aye, that he did, zur," replied the foreman. "I arrived too late to see the lad race, and when I got there the track was nothing but cinders."

* * * *

"If the boss doesn't take back what he said, I'm going to leave."

"What did he say?"

"He told me to take a week's notice."

* * * *

"Now, sir," thundered counsel, "tell the court what you were doing in the interim."

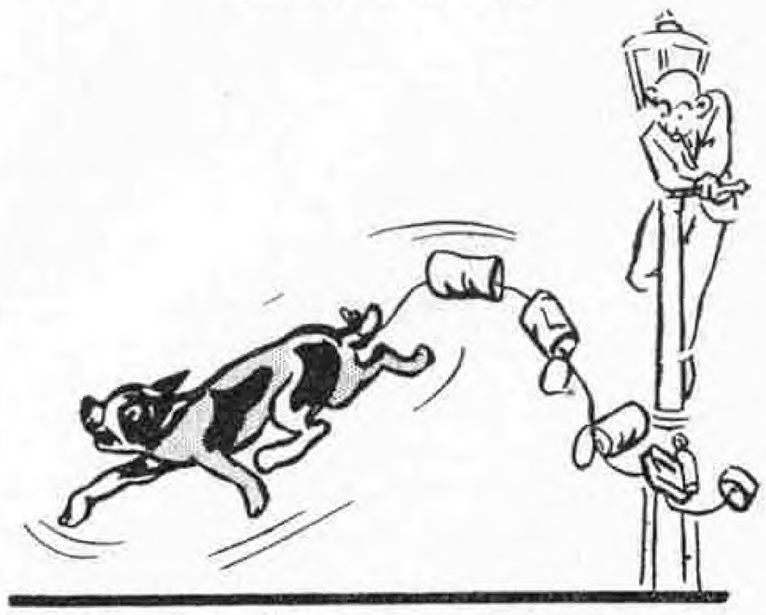
"I never went there," retorted the witness, indignantly. "I stayed in the house all evening."

* * * *

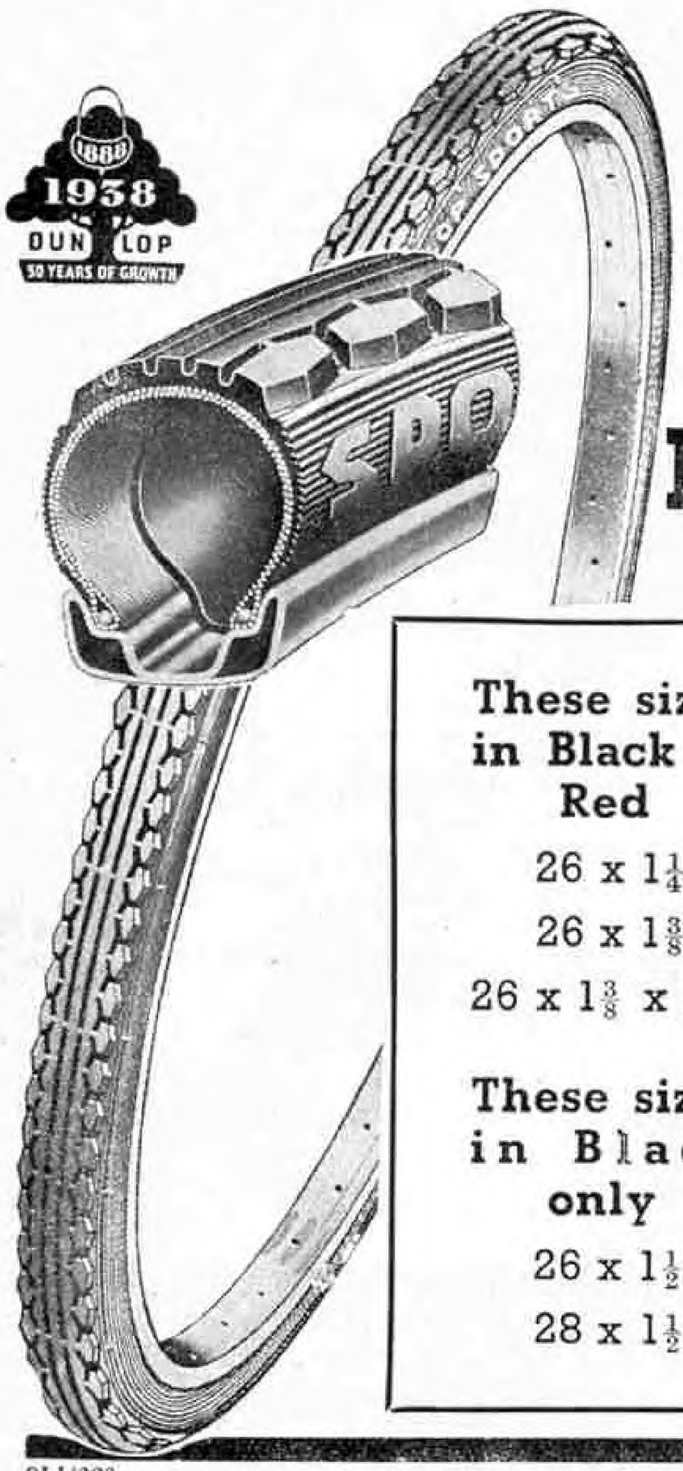
Farmer: "So you've had some experience have you?"
Youth: "Yes, sir."
Farmer: "Well, on what side of a cow do you sit to milk it?"
Youth: "The outside."

* * * *

BROADCASTING



"What did the poor little dog do when you bad boys tied the cans to his tail?"
"Oh, he just went broadcasting down the street."



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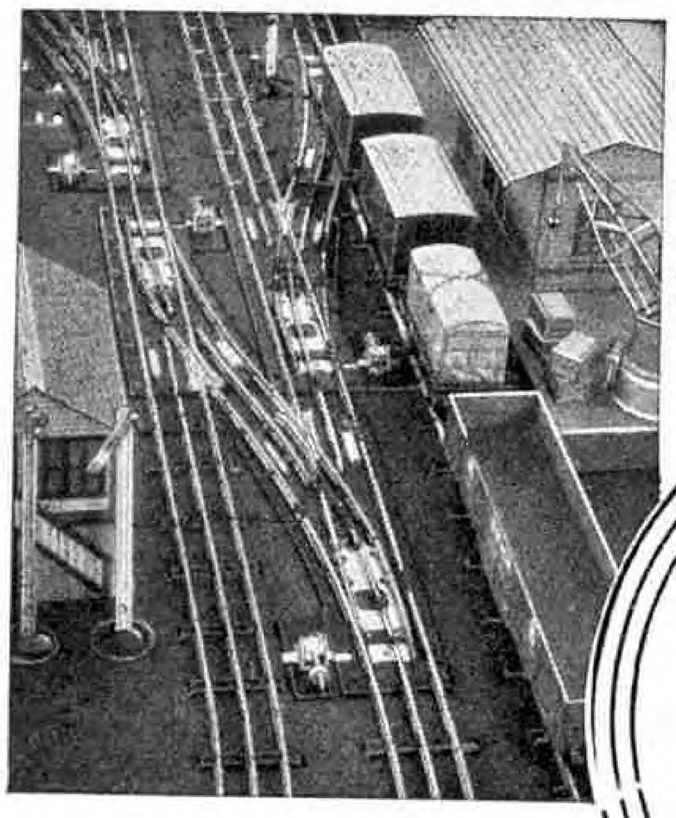
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HORNBY

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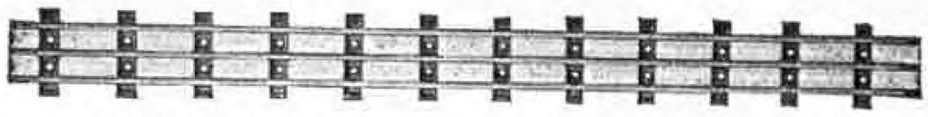
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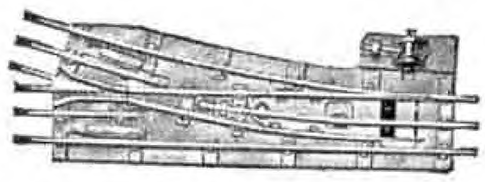


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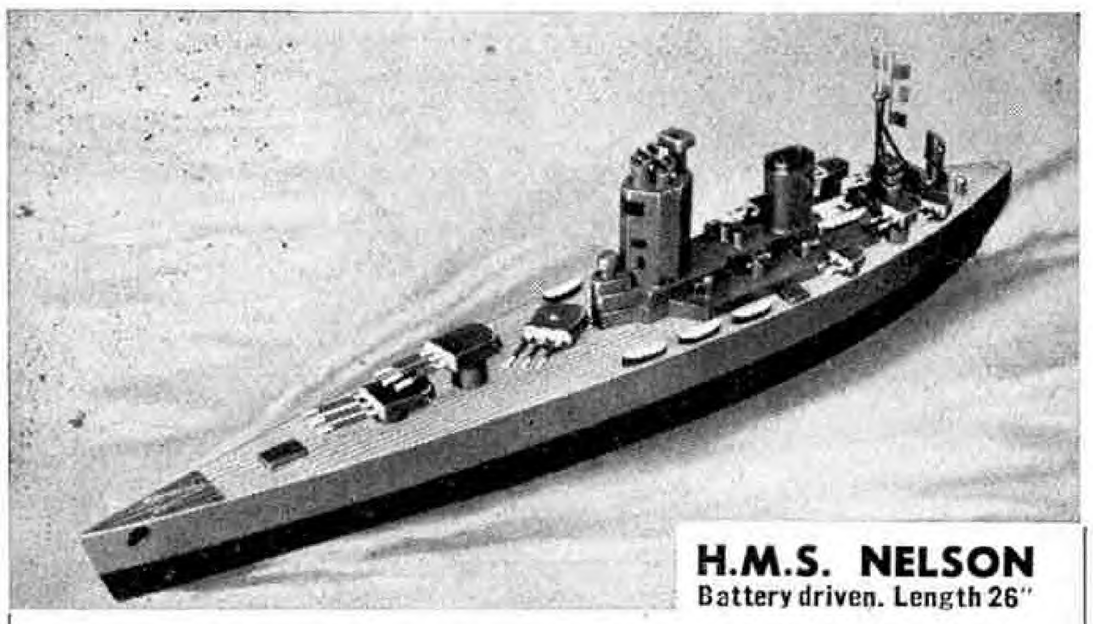
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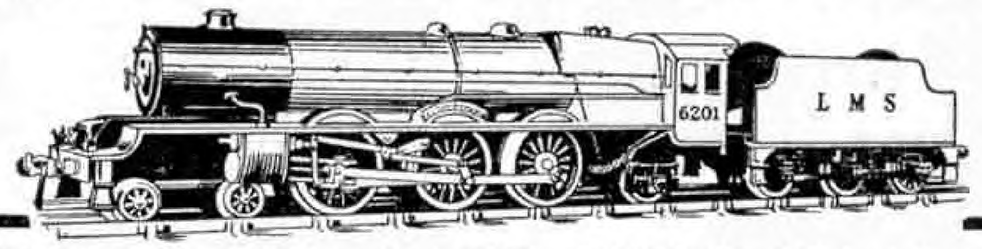
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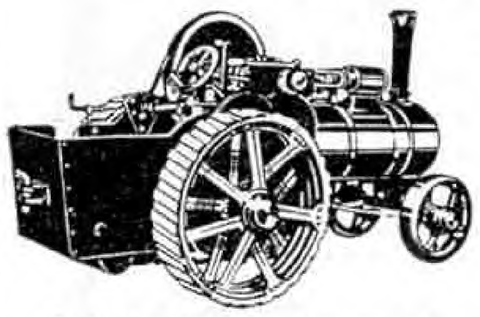
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EB1 Straight rails ... ... per doz. 6/–
EB½ „ half rails ... „ „ 5/–
EA2¼ Curved quarter rails (2 ft. radius) ... ... „ „ 4/6
EA2 Curved rails (2 ft. radius) „ „ 6/–
EPPR2 Parallel points, right-hand ... ...
EPPL2 Parallel points, left-hand ... ...
These points can be used with either 1 ft. or 2 ft. radius track. } per pair 7/–
EPR2 Right-hand points (2 ft. radius) ... ...
EPL2 Left-hand points (2 ft. radius) ... ... } per pair 8/–
EPR1 Right-hand points (1 ft. radius) ... ...
EPL1 Left-hand points (1 ft. radius) ... ... } per pair 6/6

EDS1 Straight rails, double track ... ... ½ doz. 8/6
EDSR2 Double symmetrical points, right-hand (2 ft. radius) ... ...
EDSL2 Double symmetrical points, left-hand (2 ft. radius) ... ... } per pair 7/–
EDSR1 Double symmetrical points, right-hand (1 ft. radius) ... ...
EDSL1 Double symmetrical points, left-hand (1 ft. radius) ... ... } per pair 7/–

FOR CLOCKWORK TRAINS

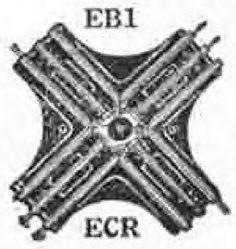
B1 Straight rails ... ... per doz. 4/–
A1 Curved rails (1 ft. radius) „ „ 4/–
PR1 Right-hand points (1 ft. radius) ... ...
PL1 Left-hand points (1 ft. radius) ... ... } per pair 3/6
PR2 Right-hand points (2 ft. radius) ... ...
PL2 Left-hand points (2 ft. radius) ... ... } per pair 3/6

CA2 Acute-angle crossings (for 2 ft. radius track) ... each 1/6
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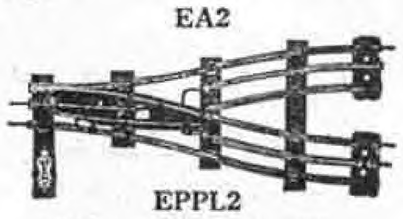

EB1

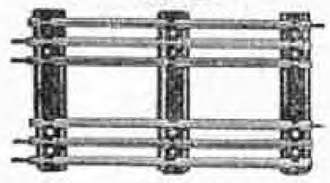

ECR

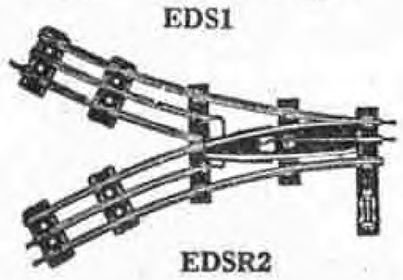

EA2¼


EB½

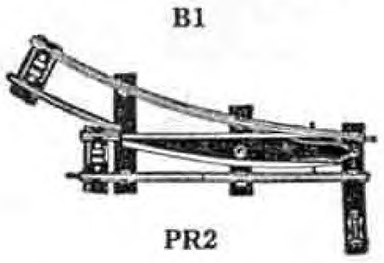

EA2


EPPL2


EDS1

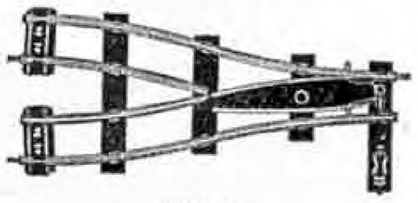

EDSR2

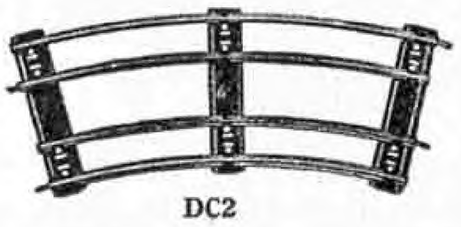

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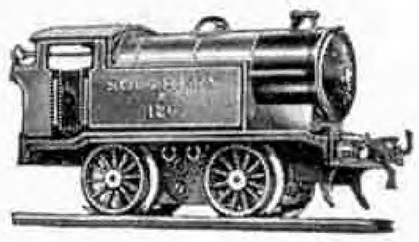
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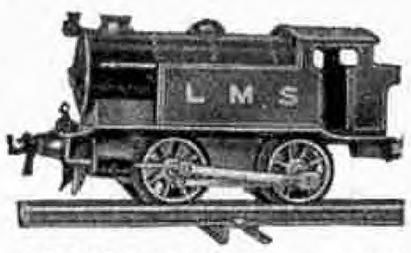
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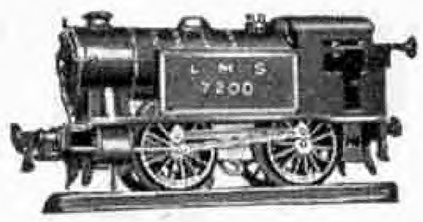
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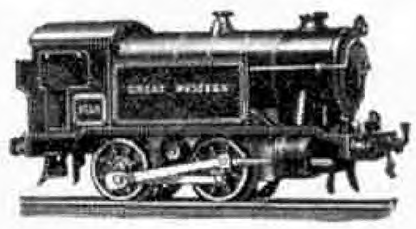
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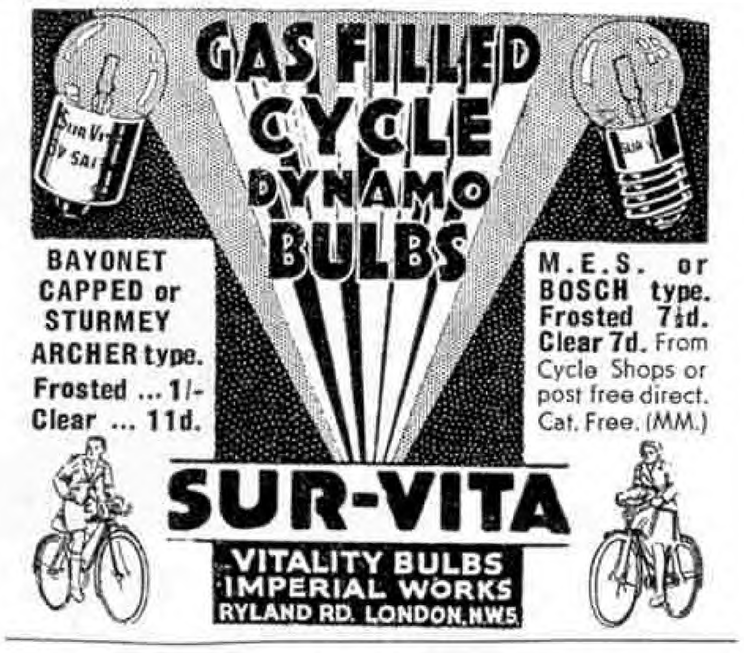
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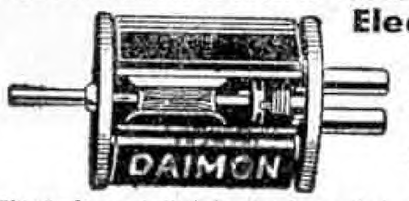
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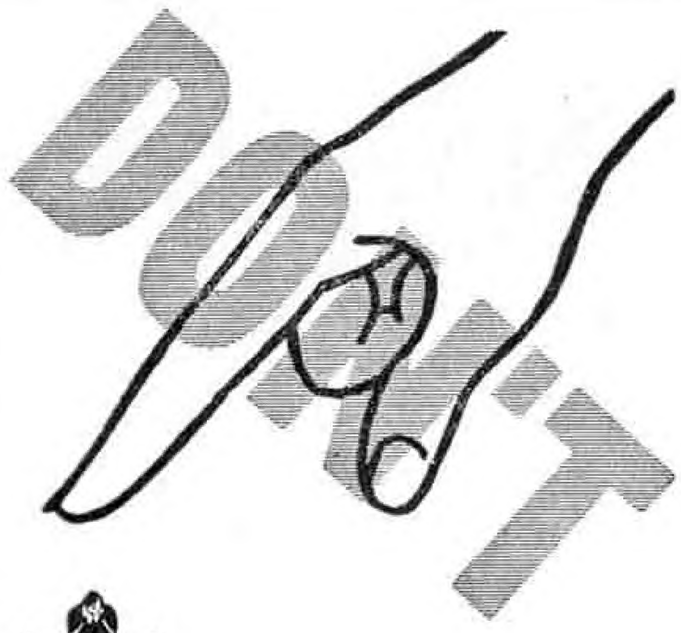
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EDITORIAL AND ADVERTISING OFFICE:—
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Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

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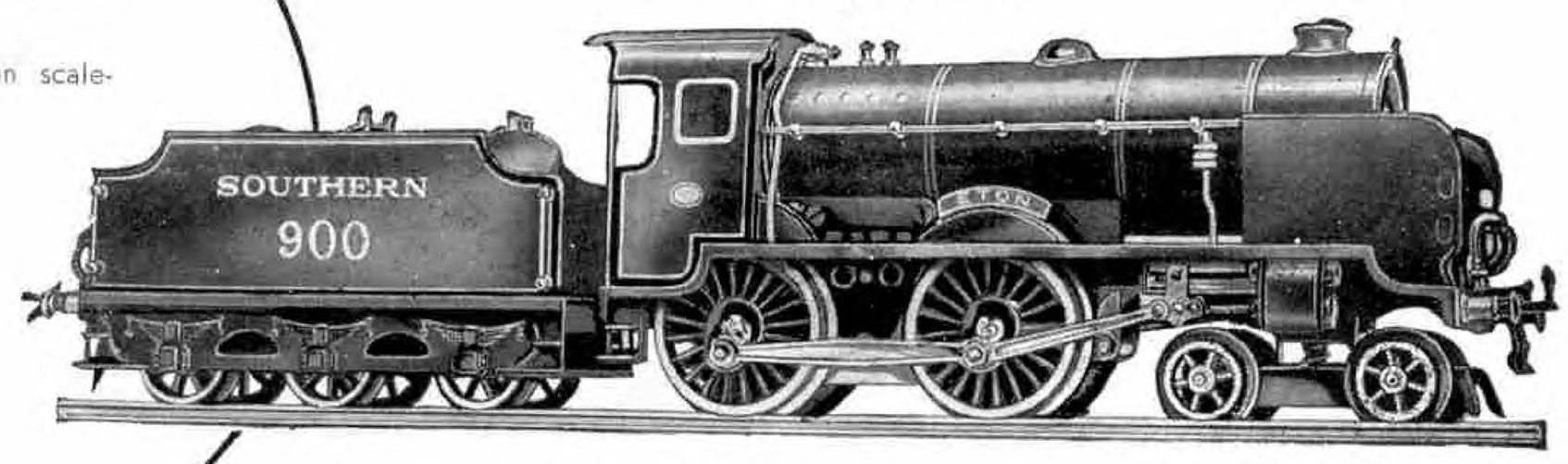
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Ask your dealer for full details of the Hornby Deferred Payments Scheme. (Not available outside Gt. Britain and Northern Ireland.)

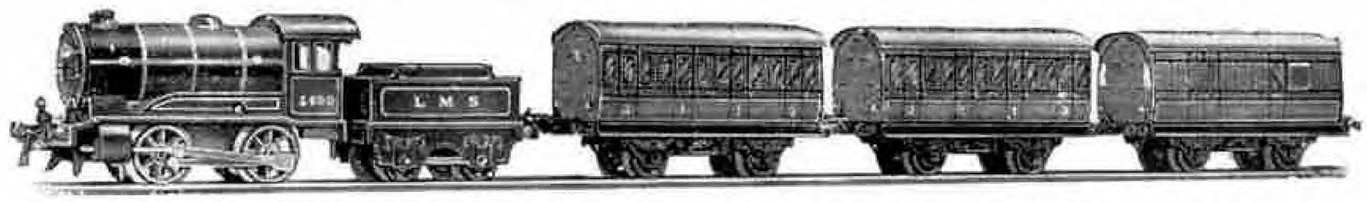
A SELECTION FROM THE RANGE OF HORNBY TRAIN SETS



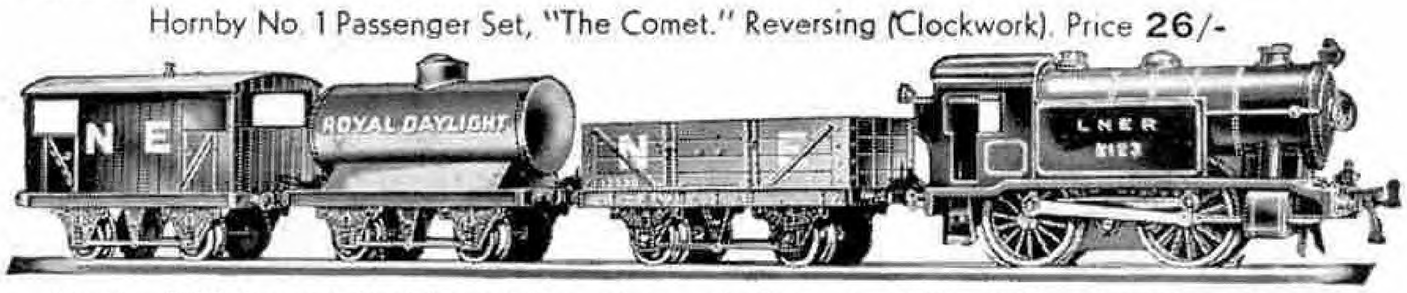
Hornby No. 3c Passenger Set, "The Flying Scotsman." Reversing (Clockwork). Price **50/-**



No. 2 Special Passenger Set, "The Yorkshireman." Reversing (Clockwork). Price **55/-**



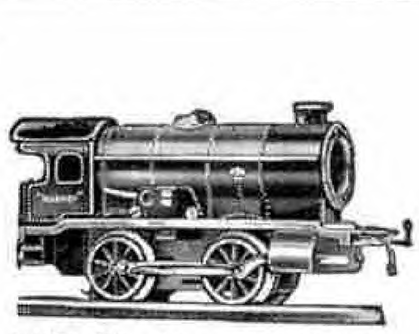
Hornby No. 1 Passenger Set, "The Comet." Reversing (Clockwork). Price **26/-**



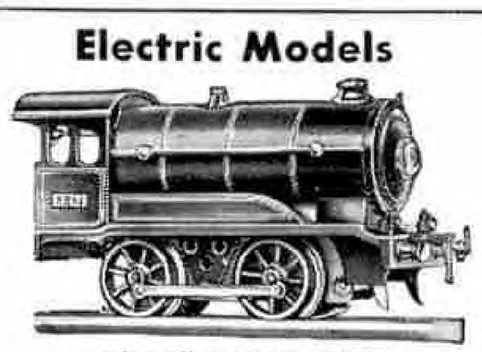
Hornby E120 Special Tank Goods Set. Automatic Reversing (20-volt Electric). Price **43/6**

A SELECTION FROM THE RANGE OF HORNBY LOCOMOTIVES

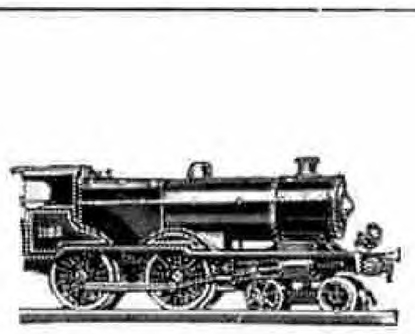
Electric Models



EM120 (20-volt) or EM16 (6-volt) ELECTRIC LOCOMOTIVE

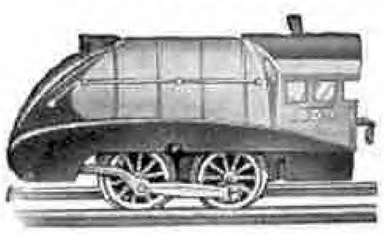


EO20 (20-volt) ELECTRIC LOCOMOTIVE

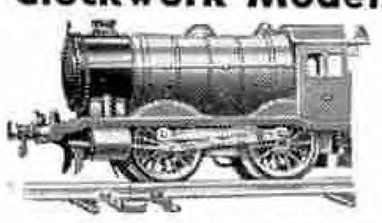


E220 (20-volt) SPECIAL ELECTRIC LOCOMOTIVE

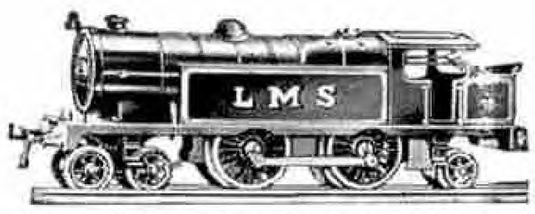
Clockwork Models



No. O "SILVER LINK" LOCOMOTIVE



No. 1 SPECIAL LOCOMOTIVE



No. 2 SPECIAL TANK LOCOMOTIVE

Electric Models

EM120 (20-volt) or EM16 (6-volt) Locomotive (non-reversing). Price **8/6**

EO20 (20-volt) Locomotive (reversing). Price **19/-**

E220 (20-volt) Special Locomotive (automatic reversing). Price **38/6**

Clockwork Models

No. O "Silver Link" (non-reversing). Price **3/6**

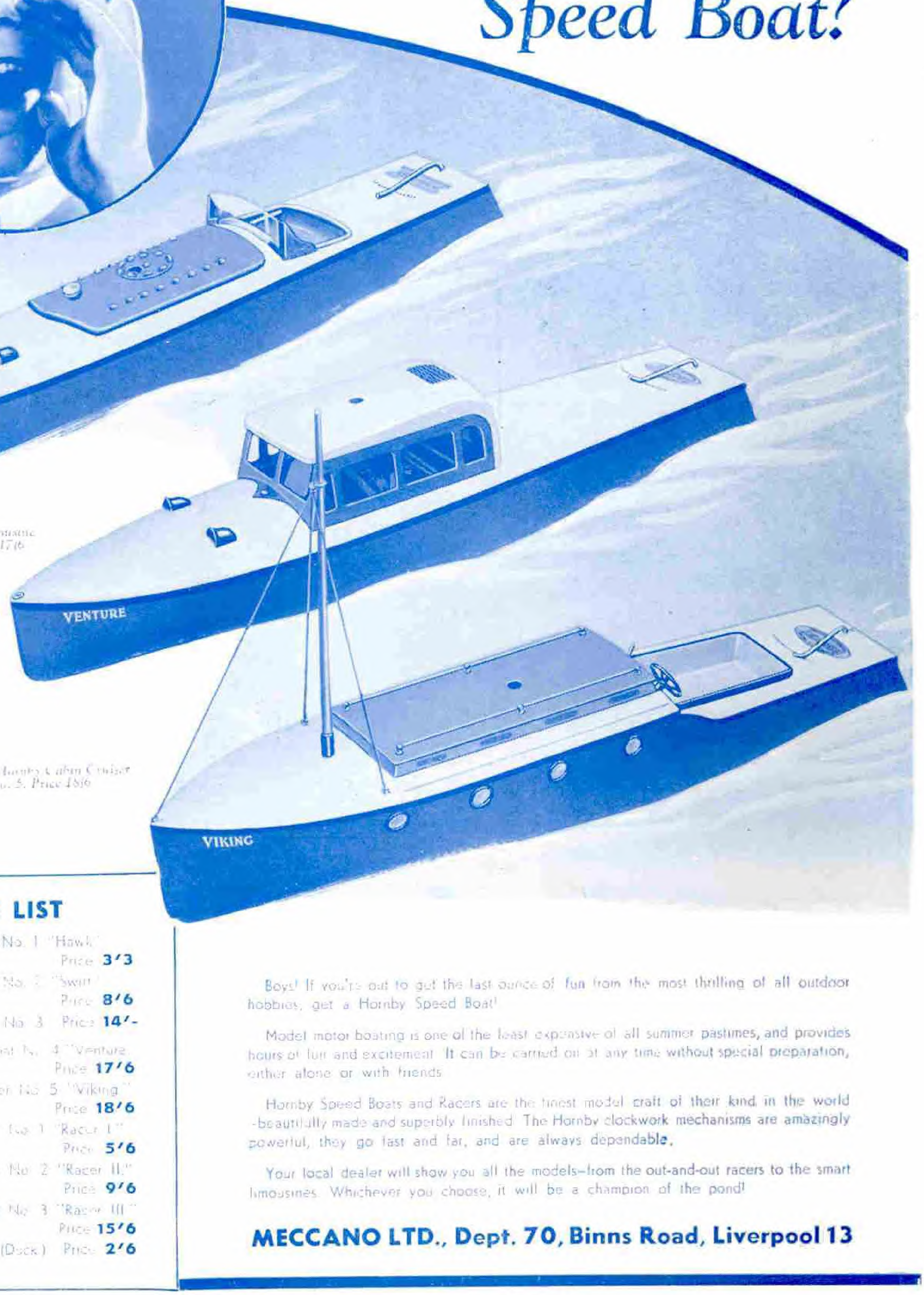
No. 1 Special Locomotive (reversing). Price **17/6**

No. 2 Special Tank Locomotive (reversing). Price **21/-**

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